

ELECTRICAL REVIEW

FRIDAY
OCTOBER 1961

WEEKLY
PRICE 1s 6d

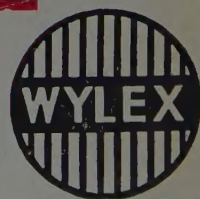
Something you know from experience...



Wylex build quality into-
Switch Fuse Control Units

AND COOKER UNITS, SWITCHED SPUR BOXES, SWITCHES, PLUGS AND SOCKETS

GEORGE H. SCHOLES & CO., LTD., Wylex Works, Wythenshawe, Manchester 22.





**For Top Speed
and TOP SALES...**



THE SIREN
WHISTLING
KETTLE

with



ELECTRICAL APPLIANCES & GROUND BASE ALUMINIUM HOLLOWWARE

**Stock and sell the range of
Swan Brand FAST BOILING
Electric Kettles**

Bulpitt & Sons Ltd., Birmingham 18

M-W.506

WORKS WONDERS

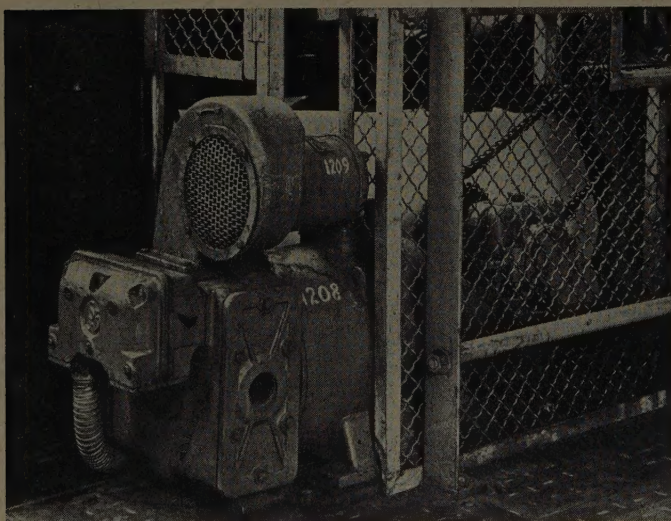
(N-S is good for you)

In very many instances, applying an N-S stepless variable-speed drive to an existing machine has greatly improved quantity and quality of output by providing **exactly** the right speed for varying conditions.

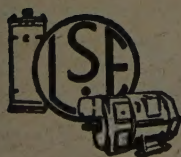
N-S variable-speed a.c. motors up to about 20 h.p. are normally available from stock. This is worth remembering when you are seeking ways and means of improving production **now**, without having to wait a year or more for new plant.

Although frequently used with manual control (either direct or from remote push-button), these small motors are just as adaptable as larger N-S machines for incorporation into automatic control schemes.

For fuller details write for Publication 31/SP (giving stock ratings and prices) to: Laurence, Scott & Electromotors Ltd., Publicity Department, Manfield House, 376 Strand, London, W.C.2.

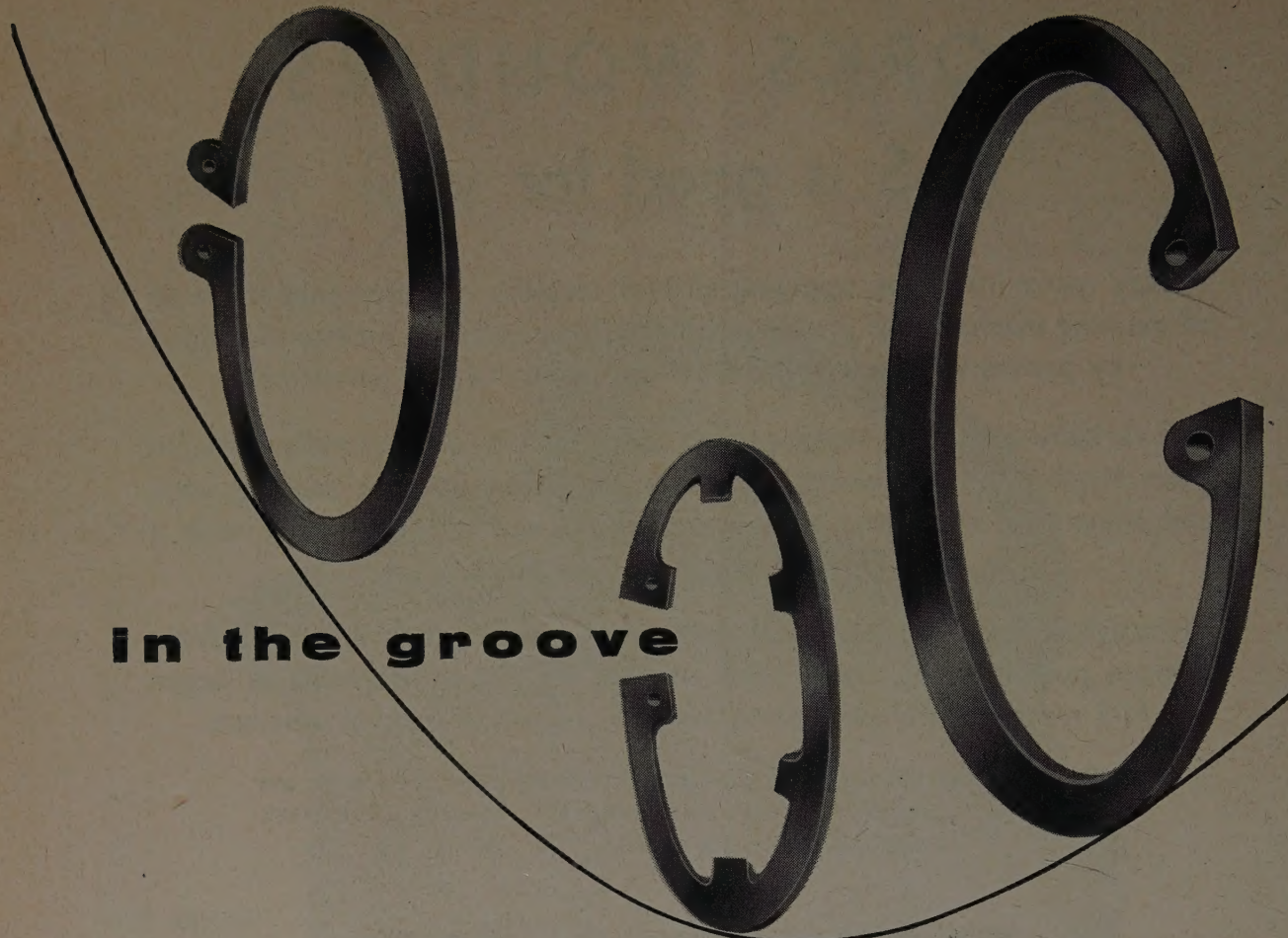


A typical N-S variable-speed motor from the standard range, applied to an embossing machine for plastic material. This motor gives stepless variation over a 7:1 speed range, but wider speed ranges can be provided when required.



LAURENCE, SCOTT & ELECTROMOTORS LTD.

Specialist Makers of Electric Motors and Control Gear since 1883 NORWICH NOR 85A



in the groove

A Seeger Circlip has the job of applying an unvarying, maximum load to the groove in which it is fitted. Whether on small or large diameters, it keeps truly circular and stays where it is put. Compact in design, spacious in purpose, a Seeger Circlip remains unmoving in the groove.

SEEGER CIRCLIPS



Automotive Engineering Limited

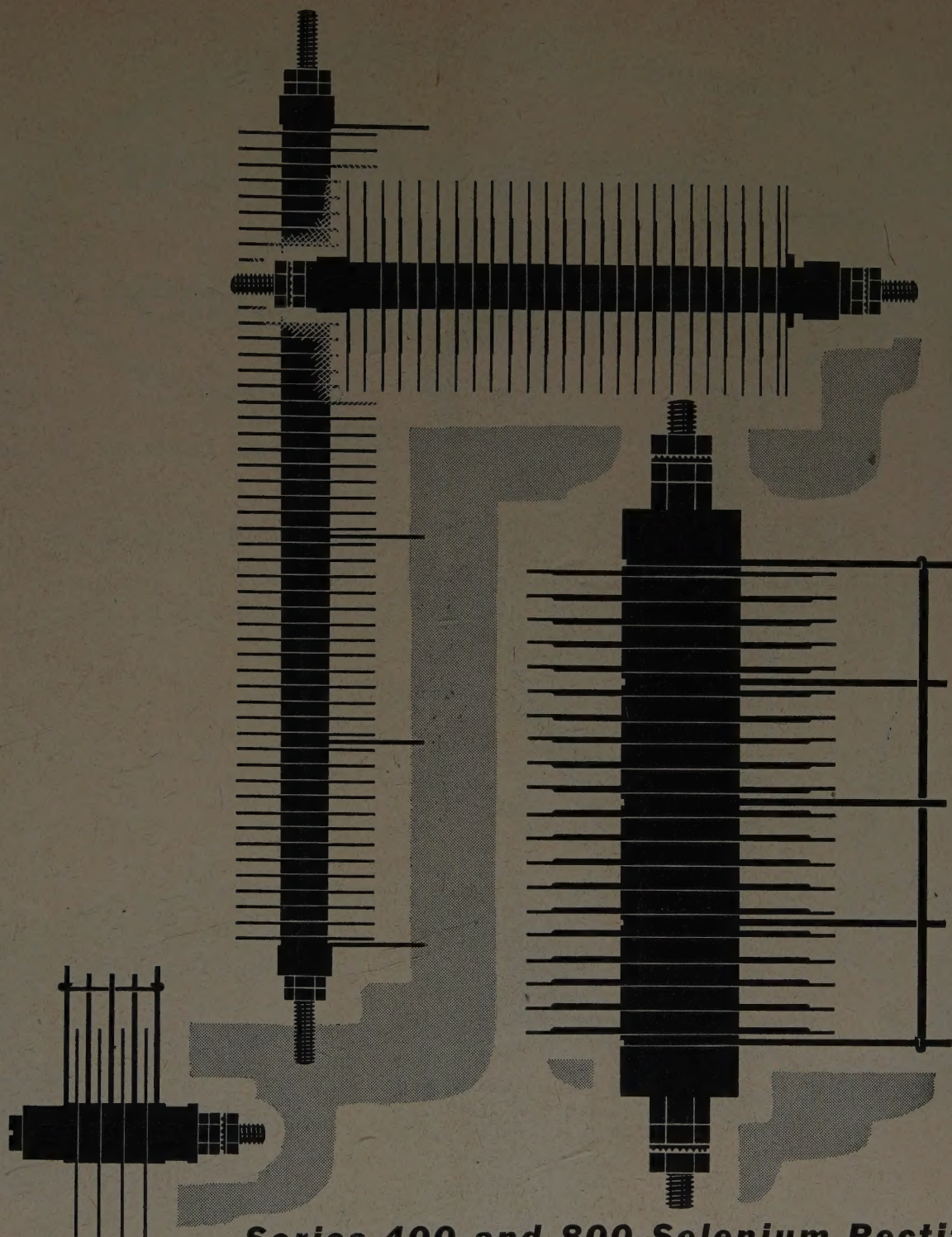
The Green, Twickenham, Middlesex

Telephone:- POPesgrove 2206/9

Telegrams:- Motif Twickenham

ONE OF THE SHEEPBRIDGE ENGINEERING GROUP

SEEGER CIRCLIPS ARE ON THE ROLLS-ROYCE APPROVED LIST



Series 400 and 800 Selenium Rectifiers



SenTerCel Series 400 and Series 800 rectifier stacks are made from two new ranges of square plates which, because of their improved performance, permit considerable savings in space, weight and cost.

- * Fully comprehensive range of plate sizes.
- * Available with or without cooling fins.
- * Savings in space, weight and cost.
- * Supplied ready wired or bus-barred.
- * Simplified connection arrangements.

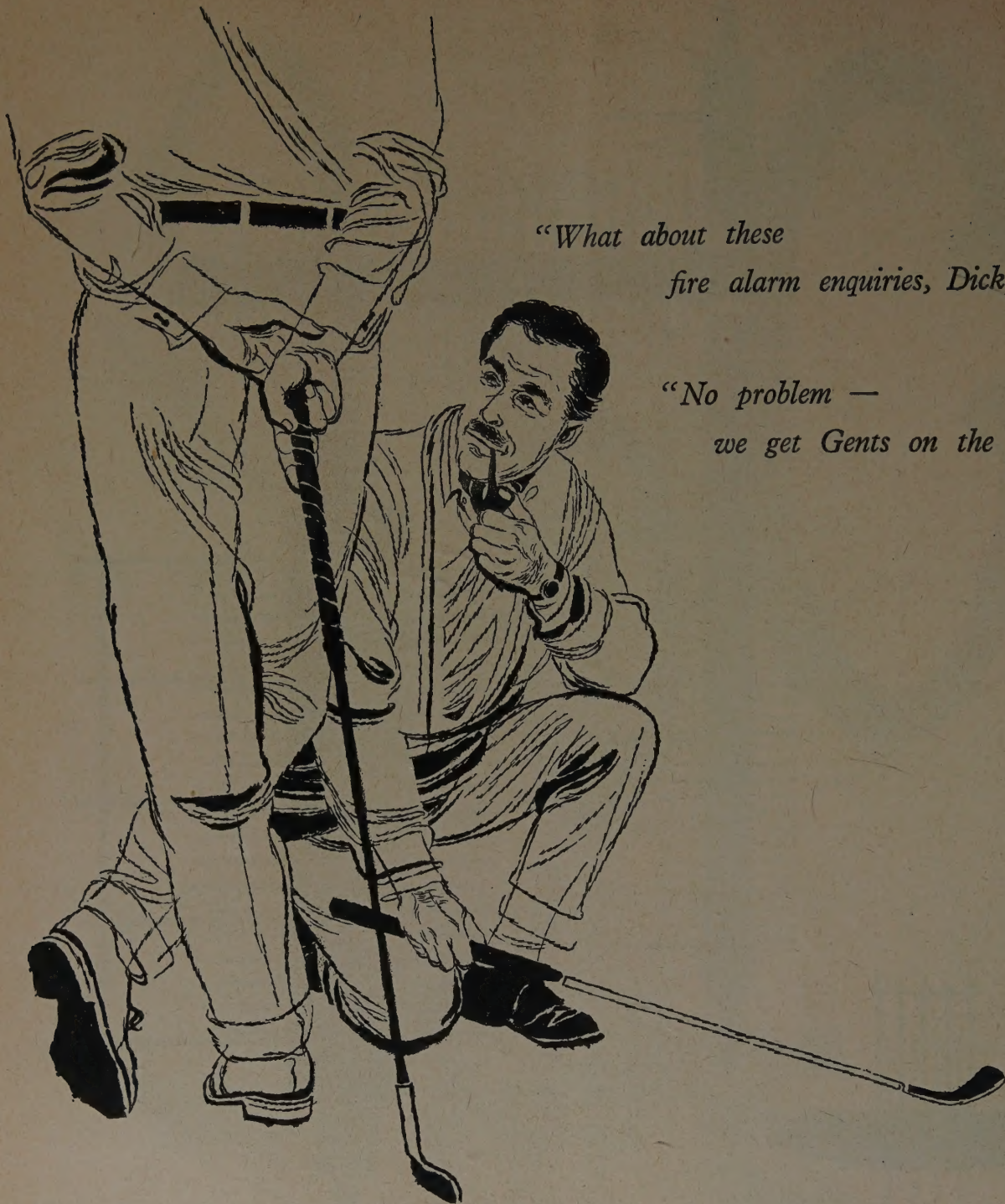
Write or 'phone for relevant technical publications.



60/7MF

Standard Telephones and Cables Limited

RECTIFIER DIVISION: EDINBURGH WAY • HARLOW • ESSEX



*"What about these
fire alarm enquiries, Dick?"*

*"No problem —
we get Gents on the job."*

GENTS
OF LEICESTER

fire alarms — don't give fire a chance!

Experience counts . . . Gents have had over sixty years in the fire alarm business and make equipment ranging from simple manually-operated systems complying with the Factory Act to comprehensive detector systems, approved by the Fire Offices' Committee, that give the alarm automatically — *day or night*.

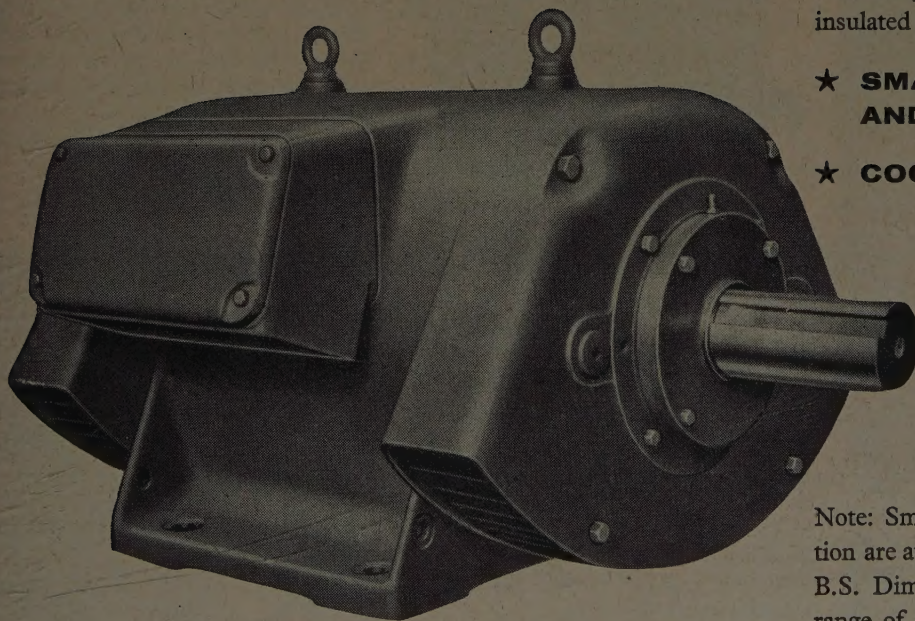
GENT & COMPANY LIMITED • FARADAY WORKS • LEICESTER • London Office and Showroom: 47 Victoria Street, London S.W.1.
ALSO AT: BIRMINGHAM • BRISTOL • EDINBURGH • GLASGOW • NEWCASTLE • BELFAST

80-285 h.p. motors with Class 'E' Insulation

**A new range of induction motors—
squirrel-cage, Type NC
and slip-ring, Type NW**

Class 'E' insulation permits a temperature rise of 65°C in accordance with BS 2613/1957 and compared with conventional class 'A' insulated motors, these new machines have:

- ★ **SMALLER OVERALL SIZE AND COST** *for a given rating, with*
- ★ **COOL OUTER CASING**



available for
early despatch

Note: Smaller motors with class 'E' insulation are available in the range 1-75 HP, with B.S. Dimensions. Also available is a wide range of suitable control gear.

for further details send for publication 3512-1

AEI

**Motor and Control Gear Division
Associated Electrical Industries Limited**
RUGBY AND MANCHESTER

PHOTO ELECTRIC CONTROLS BY



For counting, controlling, protecting

Londex Photo-Electric Equipment can be combined and adapted to do a large variety of jobs—automatically. When counting items on a warehouse conveyor or a production line, for example, the photo-electric eye never wanders, never gets tired or bored and Londex electronic counters can operate at speeds impossible to the human eye.

Londex photo-electric equipment can be made to detect breakages, flaws, tears, gaps and pile-ups as well as opening and closing doors, diverting conveyor flow and acting as policemen and nursemaids.

Write for comprehensive booklet No. 108. You will be fascinated by the ingeniously simple and low-cost ways in which Londex photo-electric equipment can help many of your processes.



The switch that "sees" its duty clearly

The Londex type DCR Night/Day Switch is operated by the level of daylight. It is therefore obviously more logical than a time switch. This Photo-electric robot controls lights or other electrical circuits in factories, railway sidings, loading bays, hotels and theatre foyers. Needless to say, it is just the thing for street lighting and advertising signs.

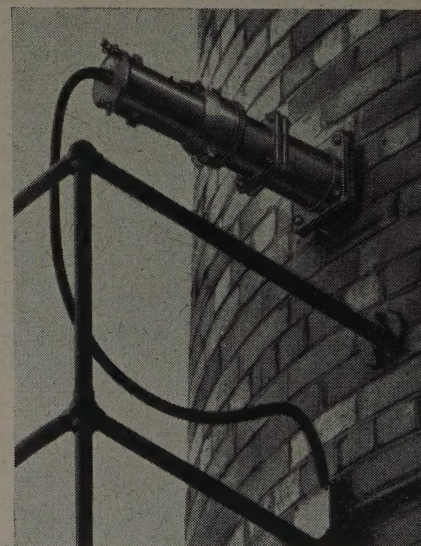
List No. 116 gives full particulars and is available on request.

Smoke Alarm and Density Units

Complies with BSS 2470

Smoke density is measured by a photo-electric cell actuated by a parallel light beam which passes across the flue on to the receiver head. Not only does it protect the user from unknowingly breaking the Clean Air Act law but it warns the engineer of any undesirable variation in smoke density.

If you have heavy smokers among your chimneys or smoke ducts, ask us for details of Unit type SAU contained on List 180.



LONDEX LTD

ANERLEY WORKS, LONDON, S.E.
Telephone: SYDenham 3111

Efficient SPACE & PROCESS HEATING

Accurate control with economy of operation
is provided by

Sturtevant SYSTEMS

Sturtevant supply all forms of heating plant to meet exacting requirements in factories, workshops, office blocks, canteens, laboratories, etc. All types of heating media are employed and existing systems adapted or reorganised. Embodying proved design methods and up-to-the-minute equipment Sturtevant systems include:—

Plenum Heating and Ventilation

Direct Heating in combination with Tempered Air Supply
High Pressure Hot Water Heating • Unit Heating
Radiant Panel Heating • Convector Heating

Sturtevant High Pressure Hot Water System — in which cooling can be incorporated if required — is particularly suitable for process heating projects and can be applied to:—

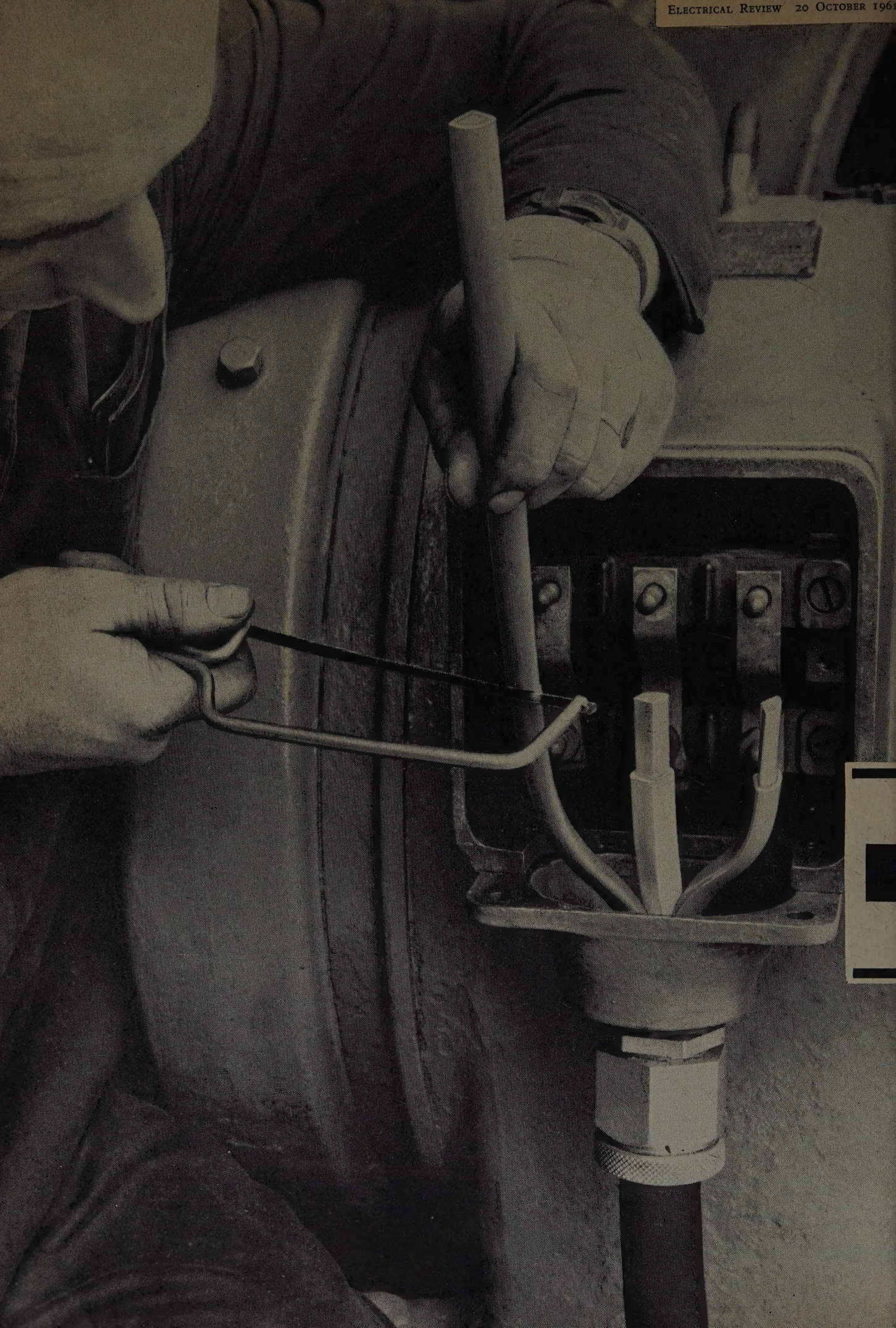
Multi-plate process • Calender rolls • Air dryers
Coils for vats • Transfer moulders • Compression moulders
Air heaters • Plywood presses • Veneer presses
Scarfig presses • Splicers • Veneer dryers • Steaming pits
Heat exchangers • Press polishing

Sturtevant Space Heating need not be independent of heating for Process Work
— Combined systems are designed to meet all requirements

Sturtevant Heating is described in publication U4104

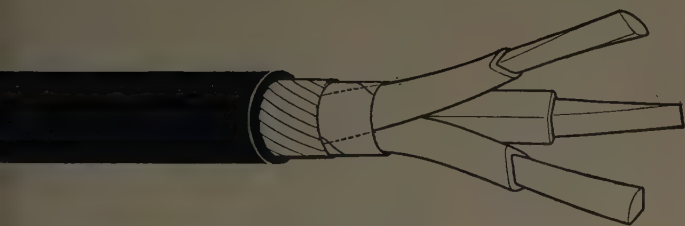
STURTEVANT ENGINEERING CO. LTD., SOUTHERN HOUSE, CANNON STREET, LONDON, E.C.4

AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD., MILLER ROAD, VILLAWOOD, N.S.W.



This cable costs less and is easier to lay and joint —it's **Solidal**

Solidal—the insulated cable with conductor cores of solid aluminium—is light, compact and cheap. It is readily manipulated and easy to lay and joint. Now available from leading cable makers, Solidal offers real economic advantages. Its design and development are an example of the forward thinking and research resources of Alcan, which could be of help to you too. If you have a problem that aluminium might solve, why not get in touch with your nearest Alcan office?



COMPACT, LIGHT AND EASY TO JOINT

the solid sector-shaped conductor cores are of extruded aluminium each insulated by appropriately coloured PVC, the whole is lapped with clear tape. Outside this, a single layer of rectangular, hard aluminium wire is wound, serving the double purpose of armour and neutral. Over all is extruded the outer sheath of PVC. Solidal was developed by Alcan.

ALCAN INDUSTRIES LTD

A member of the ALUMINIUM LIMITED OF CANADA group of companies

FORMERLY NORTHERN ALUMINIUM CO. LTD

Makers of Noral Alloys

Sales Offices: **BELFAST:** Donegall House, 7 Howard Street, Belfast 32805 • **BIRMINGHAM:** Devonshire House, Great Charles Street, 3, Central 7393 • **BRISTOL:** Pelouquin Chambers, 18 St. Augustine's Parade, 1, Bristol 20351 • **GLASGOW:** 73 Helen Street, Govan, SW1, Govan 3693 • **LEEDS:** 26-27 Park Row 1, Leeds 33621 • **LONDON:** 50 Eastbourne Terrace, W2, Paddington 3281 • **LUTON:** 57 Bute Street, Luton 7364-5 • **MANCHESTER:** 23 Princess Street, 2, Central 9335 • **NEWCASTLE UPON TYNE:** Newgate House, Newgate Street, 1, Newcastle 22107 • **Cascings & Forgings Sales Division:** Middlemore Road, Handsworth, Birmingham. Northern 3671.



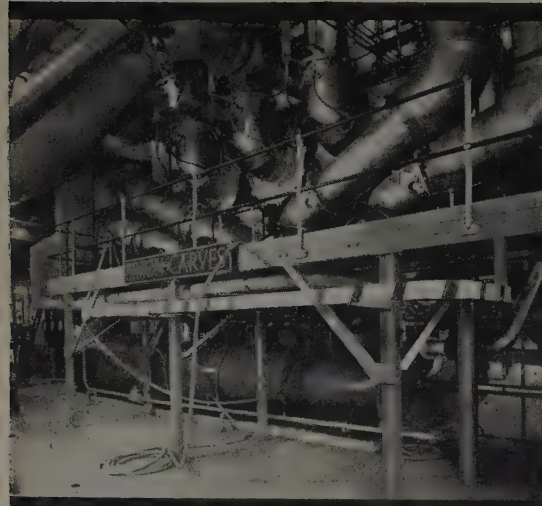
"Remarkable" SAID THE MINISTER



So said Mr. Richard Wood, the Minister of Power, at the inauguration of Britain's first once-through super-critical forced-circulation boiler. Designed and built by Simon-Carves at the Margam works of the Steel Company of Wales, it marks a major advance in large-scale steam generating practice.

The steam conditions of 3300 p.s.i. and 1060°F are the highest yet commercially used in Great Britain. The associated back-pressure turbo-alternator gives an output of 9500 KW (approximately 30% increased on the installed capacity of the existing generation plant). Process steam is exhausted at 650 p.s.i.g. and reheated to 820°F to serve the new turbo-blowers and the existing system.

Whether generating steam at pressures above or below the critical pressure, the OT boiler has many advantages over conventional natural and assisted circulation boilers. These are explained in the brochure 'OT Forced-Circulation Boilers by Simon-Carves Ltd'.



left. The operating front of the boiler is housed in the turbine building. Fuel can be blast furnace gas or fuel oil or a mixture of both.

right. The central control panel. From here, both the boiler and the high pressure turbines are controlled.



OT FORCED-CIRCULATION BOILERS BY

Simon-Carves Ltd

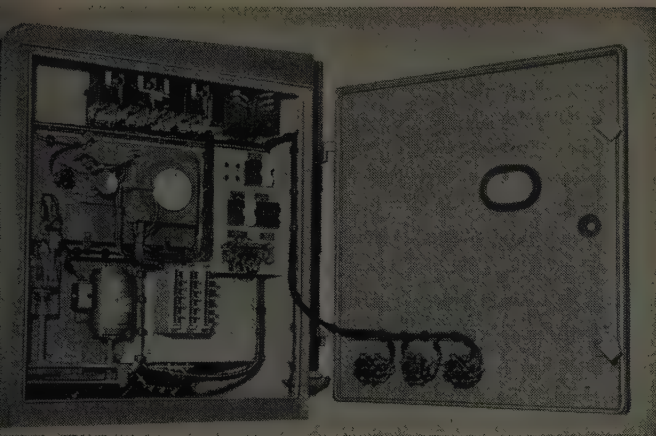


MEMBER COMPANY SIMON ENGINEERING LTD

CHEADLE HEATH, STOCKPORT • AND AT CALCUTTA • JOHANNESBURG • SYDNEY • TORONTO



Type HS 132 kV Fully Insulated



Type "F" up to 33 kV, 200 amps



Type HS up to 66 kV, 400 amps

N-LOAD TAP CHANGERS

Manufacturers of Transformers up to the largest sizes and highest voltages, we are in the forefront in the design and manufacture of high-resistor on-load tap changers for a wide range of applications. Designed as self-contained units for direct attachment to the Transformer tank, our equipments are supplied to other Transformer manufacturers both home and overseas. A very considerable output of tap changers has enabled us to effect a measure of standardisation without limiting in any way the extensive range of applications.

PERFORMANCE RATINGS and VOLTAGES

On-load tap changing equipment is available for service voltages:—
 11 kV, 33 kV, 66 kV, fully insulated.
 11 kV Neutral end or fully insulated.
 33 kV Neutral end or fully insulated.
 Current ratings: 100 up to 1250 amps.

Performance ratings cover requirements for power transformers up to the highest ratings and highest service voltages.

consult-



A member of the Hawker Siddeley Group

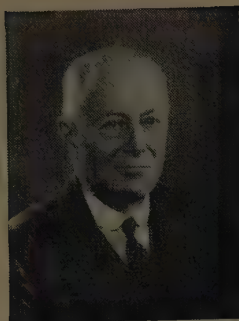
Sole U.K. representatives for ASEA Sweden

FULLER ELECTRIC LIMITED

FULBOURNE ROAD LONDON E.17

Telephone: LARKSWOOD 2350

Also at Birmingham, Glasgow and Manchester



1912-1961

THE STORY OF BELLING & COMPANY LIMITED

No. 40 OCTOBER 1961

*Half-Yearly Report of the Governing Director to all Employees
and also to our many customers and friends in the Electrical Trade*

We have now completed the first six months of our current year and I am very gratified to be able to report that our sales from the 1st April to 30th September have increased by 20% over the same period of last year. This I think is a first-class effort, bearing in mind present day conditions, and it is also getting quite near to our target figure of 25% which we set for ourselves.

Profits: In spite of the many advances in the cost of materials and increased wages during the period in question we are so far still managing, by improved methods of production and higher productivity, to hold our own without increasing our prices to the public. As an incentive for the forthcoming six months I shall again be paying out an interim share of the profits to all our employees at the same rate as we did this time last year.

Prospects: For the next six months I think these are reasonably good providing there are no serious world complications of any kind. You will be pleased to know that our Works have been operating at full capacity throughout the year as usual, fortunately without any short time or redundancy. We are continually adding to our employees which number some 3,300 at the present time.

Fires: Both radiant and convector types are now selling extremely well and this in spite of the fact that the early Autumn weather was rather warm. However, we have very good stocks both at Enfield and Burnley, but now that there is a nip in the air we do not expect these will last very long.

Cookers: Our Classic 60 four-plate cooker is forging rapidly ahead and is earning high praise for its "Classic" appearance and its many practical features, which the modern housewife has been quick to appreciate. Our 47AB and 48 models are, of course, also selling strongly and, as a matter of fact, our 47AB is still our biggest and best seller.

Extensions: These have proceeded quite well in the last six months in spite of bad weather. Our new buildings at

Enfield and Burnley are partly in use and will be in full production fairly soon. We shall then have well over 1,000,000 sq. ft. of production space at work. Incidentally, our total area of land (all freehold) is about 70 acres so we have plenty more building space available.

Advertising: I hope you have noted our special efforts in this direction which have already brought in many thousands of applications for our new catalogue every week. We are glad to have been able to maintain our old prices, as this makes it simpler for everyone. Our present issue is 500,000 large catalogues and we hope to be repeating this shortly. We feel that every catalogue distributed sells something so please do not hesitate to let us know your requirements.

We do look forward to your support again this coming fire and cooker season and I think one point I might mention is that our capital, labour and material are all entirely British and our profits remain in England. Of these latter we distribute a fair proportion to our employees, and the balance, after payment of tax and the few odd pence I take out myself personally, goes back into further extensions. This current year, for instance, we have already spent over £200,000 on extensions so we do hope to be able to meet your requirements perhaps a little more promptly than in the past,

We are still in the happy position of not owing anything to anyone, having no mortgages or debentures and no Bank overdraft. I shall be having much more news for you in my annual report at the end of March 1962 which you may remember is our Golden Jubilee Year.

Belling & Co. Ltd., Bridge Works, Enfield, Middx. HO Ward 1212

This **new** **G.E.C.** Contactor performs a minimum of 5 million operations without wear affecting performance



G.E.C. Installation Equipment Group has the new approach to designing contactors. These are some of the features which contribute to an outstanding performance, making G.E.C. contactors most suitable for electric space heating control (under-floor heating, etc.) and for lighting control:

- * *Noise suppression* by rubber mountings between contactors and case.
- * *Ease of installation and maintenance.* Generous wiring space in enclosed contactors and ample knockout entries in pressed steel case.
- * *Easily replaceable silver faced contacts* (two breaks per pole).
- * *Good arc-resisting and non-tracking properties* of moulded arc box.
- * *All models* in the new range of G.E.C. Contactors (20 amp—200 amp A.C., 40 amp D.C.) exceed the requirements of BS775:1956 and may be fitted with side mounted auxiliary switches, neutral links, paralleling links and control fuses.

COMPETITIVE PRICES

G.E.C. Contactors are available at very competitive prices, too.

IMMEDIATE DELIVERY from wholesalers throughout the country. For further information ask your wholesaler for G.E.C. publication X5366.



that's the New Approach
of **G.E.C.**

BEAUMONT

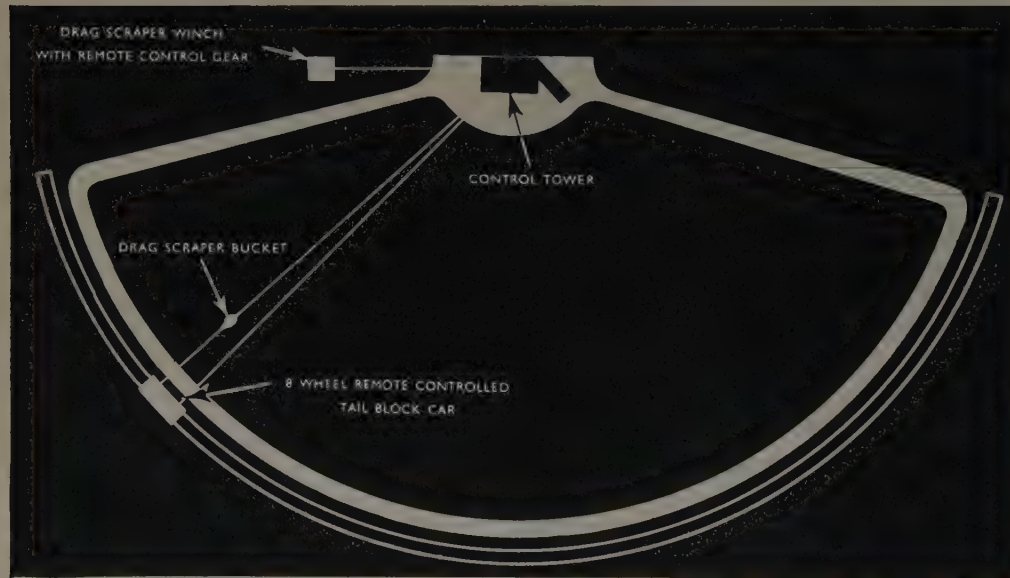
DRAG SCRAPERS

Drag Scrapers can be effectively applied to almost any shape of store ground and they have the advantage of simple control of Scraper Bucket and tail car by one man housed in a weatherproof cabin, with clear visibility of all operations.

Standard designs are available for light, medium and heavy duties.



The stocking out and reclaiming tower.



The Beaumont Drag Scraper system for stocking out and reclaiming coal at the Central Electricity Generating Board's Goldington Power Station, is an important section of the complete Coal Handling Plant which includes wagon tipplers, gravity bucket and belt conveyors supplied by International Combustion Products Limited

Please write for full details

BEAUMONT is a registered trade name.

IC

INTERNATIONAL COMBUSTION PRODUCTS LIMITED

LONDON OFFICE: NINETEEN WOBURN PLACE, WC1. TELEPHONE: TERMINUS 2833
WORKS: DERBY



UNISTRUT

TRUNKING

FOR CHEAPER AND NEATER LIGHTING INSTALLATIONS



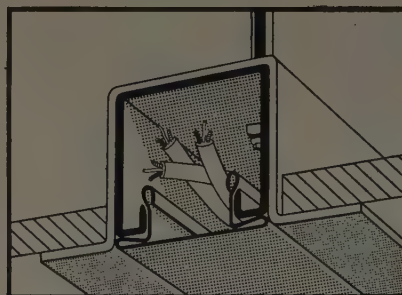
THE UNISTRUT SYSTEM provides the cheapest and simplest method of installing lighting units. UNISTRUT is rapidly and easily assembled, thus reducing on-site costs and time, and it ensures perfect alignment, even when butted to form continuous runs. UNISTRUT trunking accepts most types of fluorescent or tungsten fittings anywhere along its length, and permits the re-arrangement of the lighting at any time.

Send now for comprehensive literature on UNISTRUT, the answer to your framing and support problems. Write to:—

UNISTRUT DIVISION OF SANKEY-SHELDON LIMITED



43-45 Broadwater Road, Welwyn Garden City, Herts.
Tel: Welwyn Garden City 26321 (4 lines)



UNISTRUT dual-purpose trunking

Where trunking and false ceilings are to be supported, the UNISTRUT 'Top Hat' section is simply placed over the top of the required length of basic UNISTRUT channel. This permits ceiling panels to be closely fitted to each side of the channel, which is itself left open until the wiring installation is completed. Closure is made by standard UNISTRUT closer strip which gives a neat, flush finish.

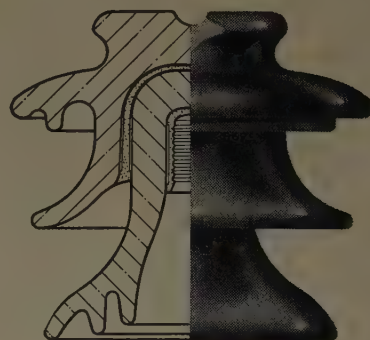
ELECTRICAL PORCELAIN ENGINEERING

BY DOULTON

Backed by a century and a half of ceramic manufacture, a first-class research laboratory, a modern factory, a highly trained technical staff and the latest test equipment, Doultons offer an unrivalled service to the electrical engineering world.

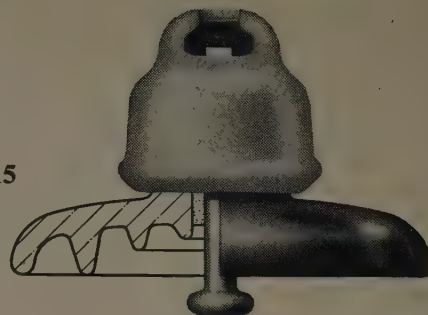
Doulton Insulators are made for standard voltages spanning a range of 400 to 400,000 volts. Many hundreds of thousands are in use to-day over the world's surface.

Three typical designs of high voltage insulators in general use are shown below.



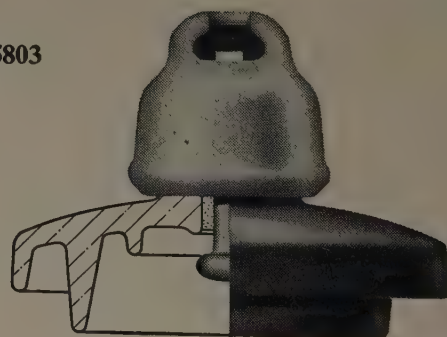
33 kV Pin Insulator, Type BC. 28

Complying with B.S. 137/1960
Minimum Failing Load 2400 lb.



Disc Insulator, Type P.42B/8/5515

Complying with B.S. 137/1960
Minimum Failing Load 42000 lb.



Disc Insulator, Type F.42B/6 3/4/5803

Complying with B.S. 137/1960
Minimum Failing Load 42000 lb.

*Write to Publicity Department
for latest literature*

DOULTON INDUSTRIAL PORCELAINS LIMITED

ROYAL DOULTON POTTERIES, WILNECOTE, TAMWORTH, STAFFS.





NOT TO WORRY

**Constant
voltage
is**

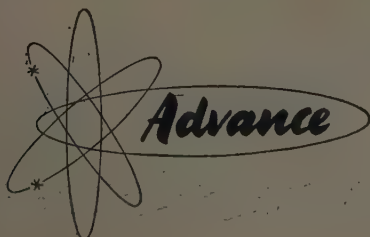
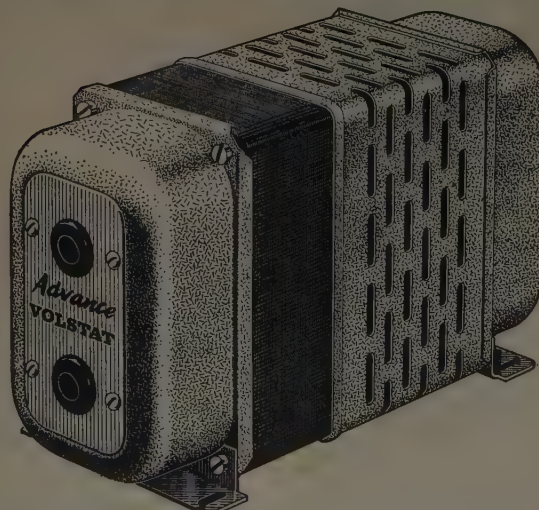
assured

with a

VOLSTAT

A VOLSTAT is the answer to many a.c. voltage fluctuation problems. In most cases, a standard type is all that is required—but there are occasions when a special design may be necessary. Either way an 'Advance' Technical Representative will be pleased to investigate your own particular problems, and recommend a VOLSTAT best suited to your needs. VOLSTAT stands for a complete range of Constant Voltage Transformers produced by 'Advance'—the leading authority on voltage stabilization.

Full details in Folder D63 available on request.



COMPONENTS LIMITED

MAINS STABILIZATION DIVISION

ROEBUCK ROAD • HAINAULT • ILFORD • ESSEX • HAINAULT 4444



The mushroom look in lamps has caught on — fast. Sales of Philips 'K' Lamps are rising on the wave of demand. Philips 'K' Lamps are smaller. Smarter, too. So much more compact. Elegant lamps for today's new light fittings. There's another good reason why they sell. Philips world-wide reputation for dependability. Stock Philips 'K' Lamps. Put them in your window. You'll find them profitable — very!

PHILIPS 'K'

MUSHROOM LAMPS

60w. 2/0½d. 100w. 2/0½d. 150w. 2/8. (all inc. P. Tax)

Philips lead the world in lighting



Philips Electrical Ltd., Lamp and Lighting Group, Century House, Shaftesbury Ave., London, W.C.2.

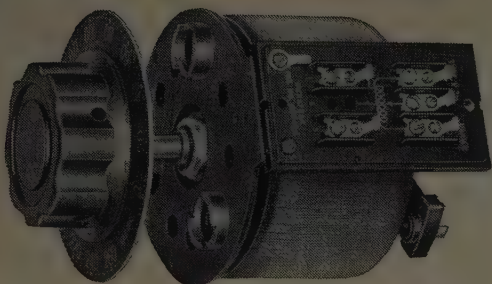
ZENITH

Variac

the
original
continuously-adjustable
transformer

VARIABLE...

... Transformers, Chokes, Resistances—we manufacture all three. Their quality merits no such adjective; this is epitomized in the trade name they bear, instilling confidence in the user and those who find ZENITH specified for components and other electrical apparatus. Style and finish throughout our varied range receive that serious consideration to completely justify this claim.



"Versatility" and "VARIAC" are virtually synonymous when the need arises for controlling voltage, speed, power or heat.

Model "V3H" operates on a 240 volt, 50 cycle supply, with a useful output continuously variable between zero and 270 volts at 1 ampere.

It is available for panel mounting, as illustrated, or for bench mounting either open or covered. Other style variations are given in Abridged Catalogue VAR.6.

Our model "V30H-M" is rated at 4.2 kVA, weight 58 lbs. Input 240 volts, 50 cycles, giving a low loss control of A.C. voltage from zero to 270 volts at 15 amperes.

Regardless of the load a VARIAC is almost sure to be available from the standard range.

Only VARIACS have the exclusive DURATRAK contact surface to withstand surges up to 1,000% of their rated current.

VARIAC Transformers are exclusively distributed in the United Kingdom, Eire and British Colonies by Claude Lyons Limited, Hoddesdon, Herts. and Liverpool 3.



The "ON" series, oil immersed naturally cooled, results from an ever increasing demand for full voltage control of larger loads. This construction gives an increased power rating over air cooled types of 12%, also complete winding protection when adverse conditions demand such a requirement.

A right angle drive is available, for back of panel mounting or motor operation.



THE ZENITH ELECTRIC COMPANY LIMITED
ZENITH WORKS • VILLIERS ROAD • WILLESDEN GREEN • LONDON N.W.2
Telephone: WILLESDEN 6581/5 Telegrams: "VOLTAOHM, NORPHONE, LONDON"

ADASTRA

ZETA COLUMN



Zeta column with post top lantern for 2/40w or 4/40w fluorescent tube.

A ONE PIECE STEEL COLUMN

Eminently suited for all kinds of Group 'B' lighting, of graceful and pleasing appearance.

The column is manufactured from steel and is circular. After manufacture it is heavily coated with zinc inside and outside by the hot dip galvanising process. The finish is noted for its durability in applications outdoors.

As a preparation for painting, phosphate treatment of the galvanised surface is recommended and column can be phosphated before leaving the factory.

Standard heights are 12', 13' and 14' above ground.

The top diameter is 3", the depth in the ground is 2' 6" and a service slot 6" x 3" is provided in the root.

Single or double brackets for pendant or side entry lanterns can be provided.

The 14' column weighs only 80 lbs and can easily be erected without any lifting appliances.

The column complies with requirements of B.S.S. 1840-1960.

POLES LTD

Head Office and Works: Tyburn Road, Erdington, Birmingham 24
Telephone: ERDington 1616
Cables "Poles Birmingham"
London Office: 98 Park Lane W.1.
Telephone: MAYfair 3074

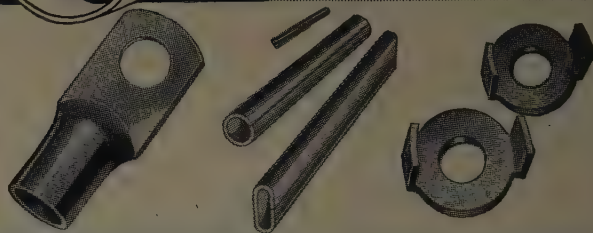
CONSTRUCTORS GROUP



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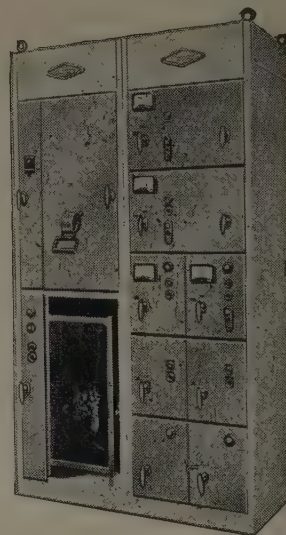
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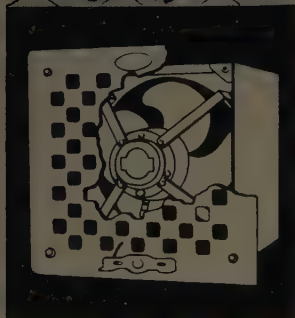
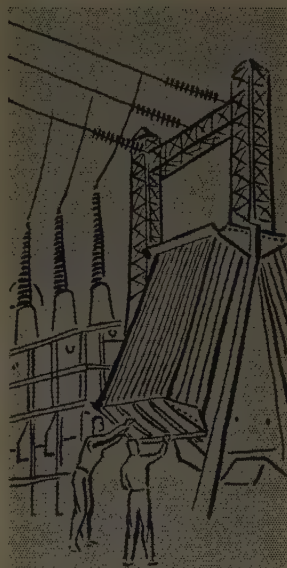
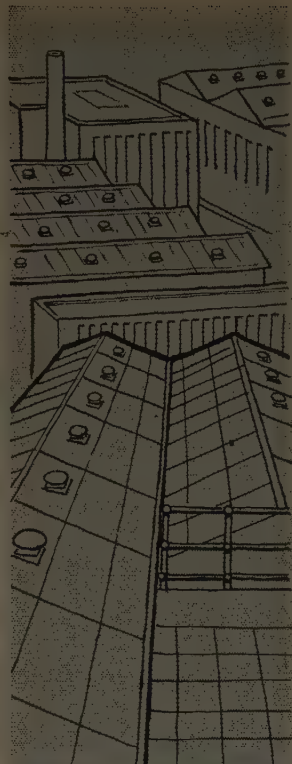
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Although you could say they were instrumental.

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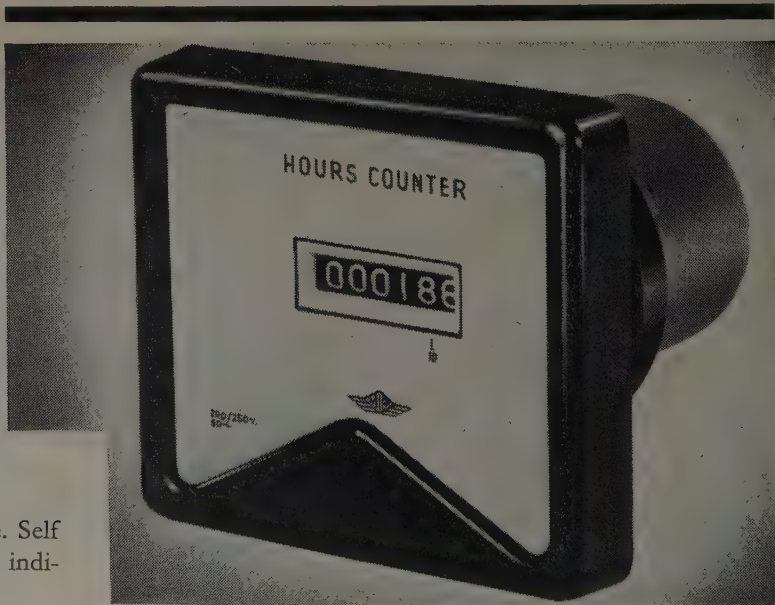
Not that M.I.P. make hats or wives or boys' tricycles or any of that jazz. They are far too busy being instrumentalists.

And to prove just what instrumentalists they are, they will send you a list of all their instruments; those that are fitted in control panels in power stations so that hard working chaps like you get hot breakfasts; those that are fitted in razor blade factories and aftershave lotion plants. Those that are fitted to keep a watchful eye on carpet looms and newspaper presses. Not to mention television transmitters and petrol refineries.

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We are indebted to Stewarts & Lloyds, Ltd., of Corby, Northants, for the above information and permission to use their photograph.



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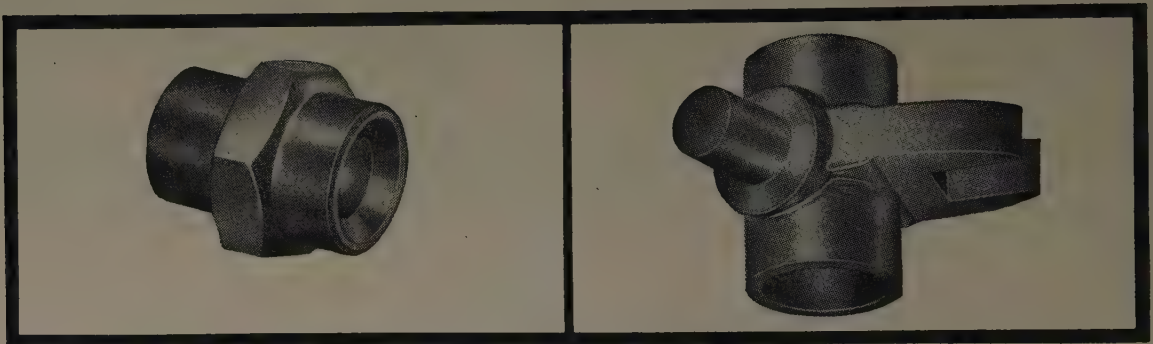


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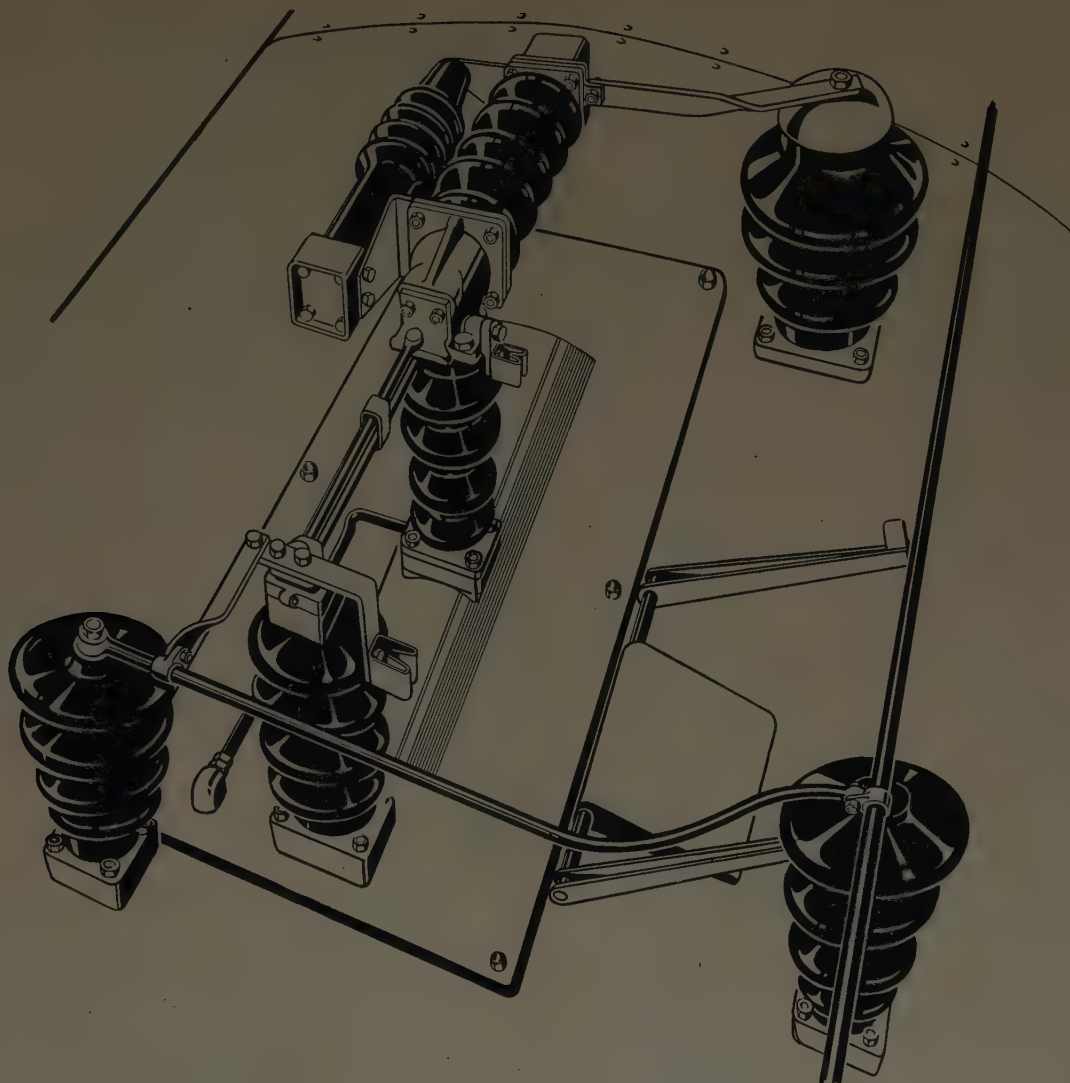
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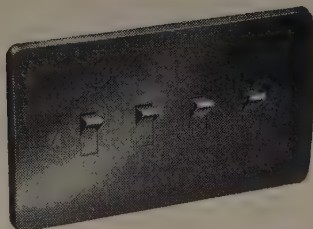
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Photograph by courtesy of Architectural Review

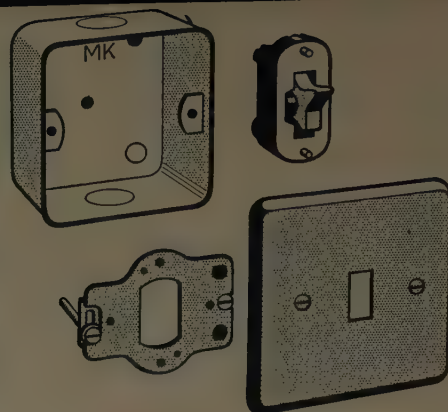
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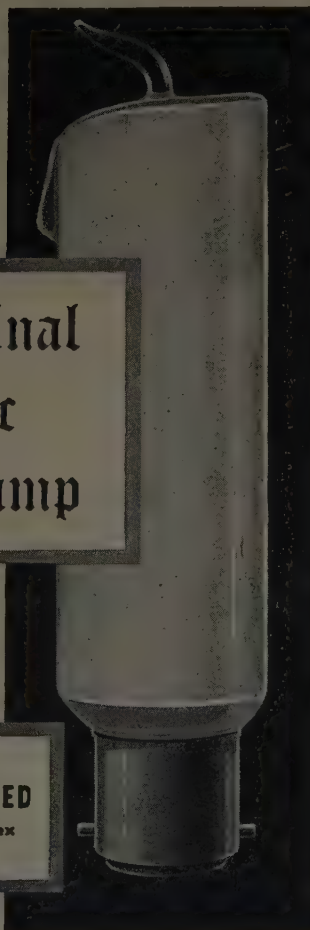
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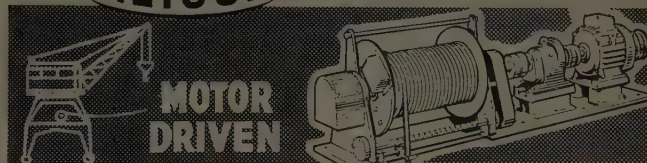
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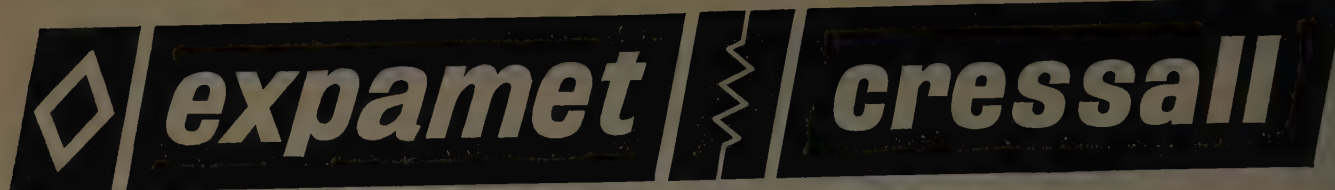
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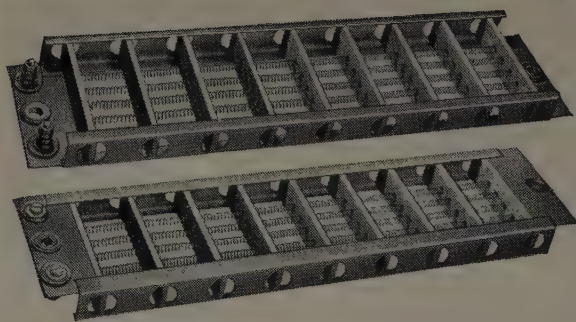
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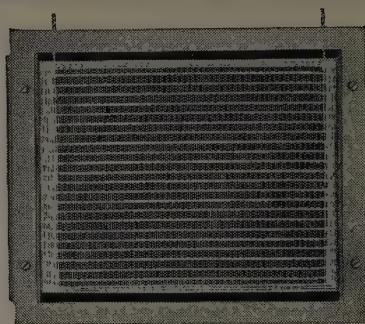


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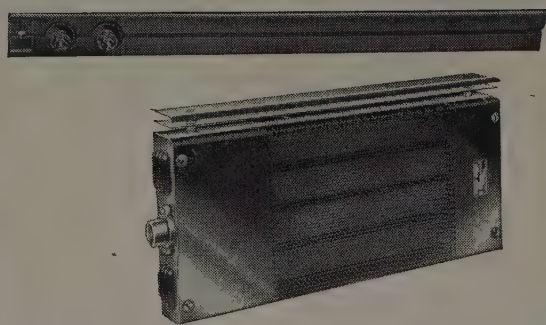
**COMPONENTS
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4 WATTS TO OVER
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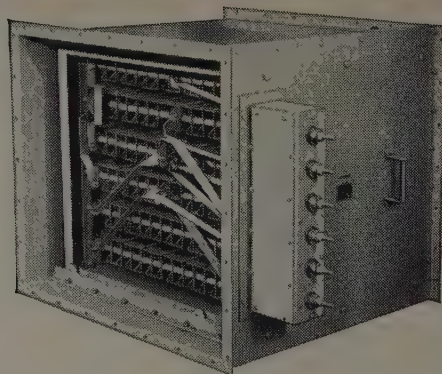
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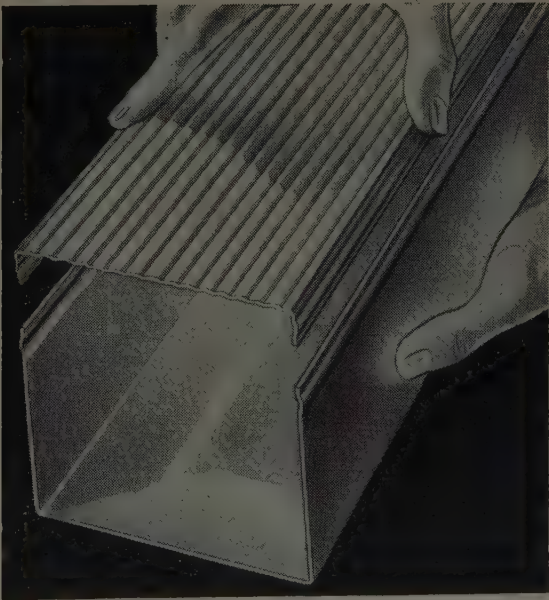
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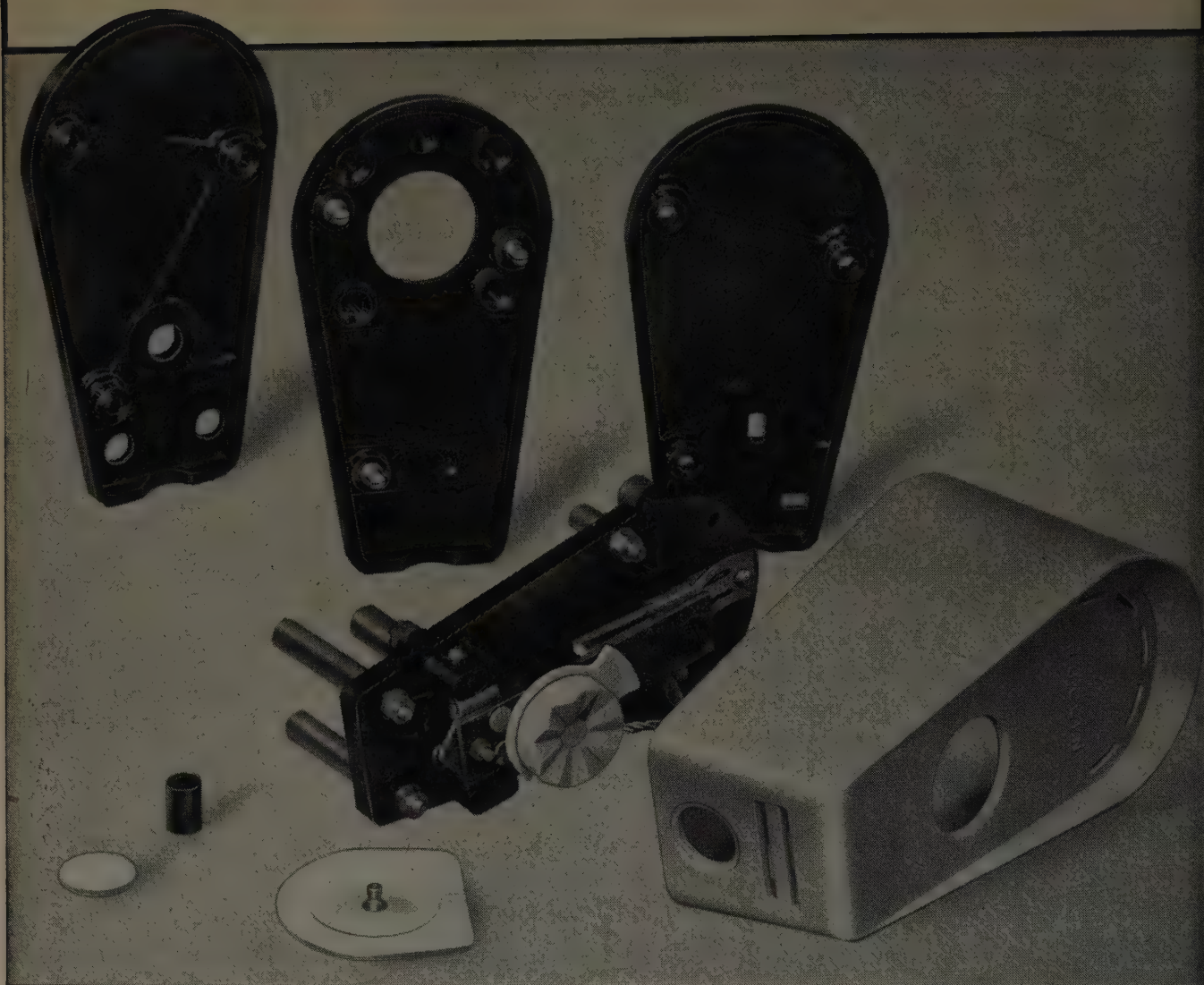
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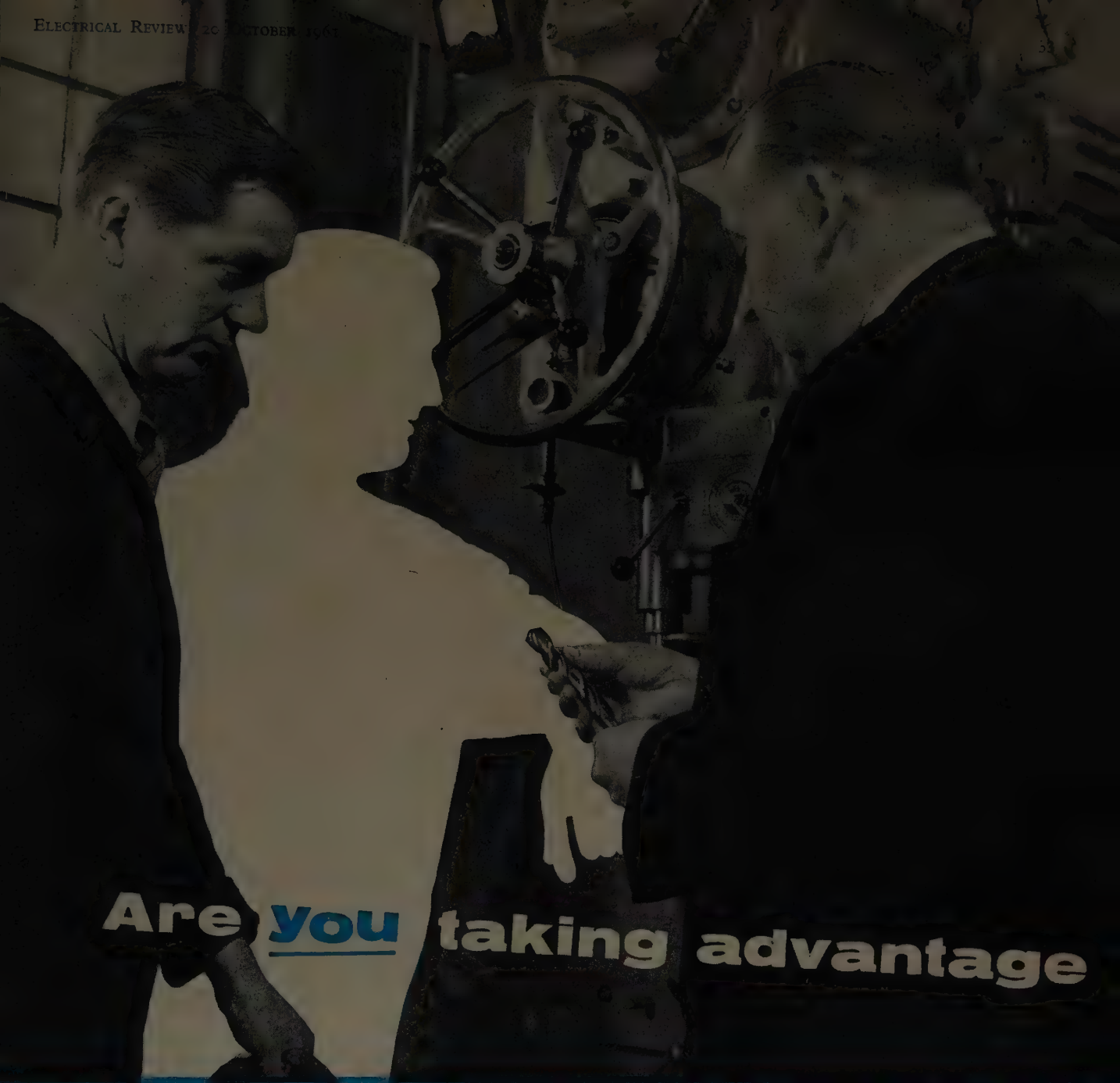
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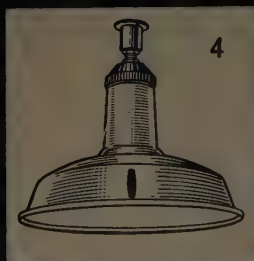
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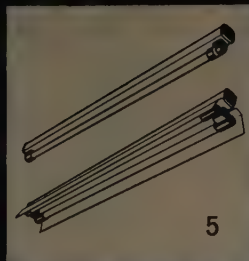
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4



5



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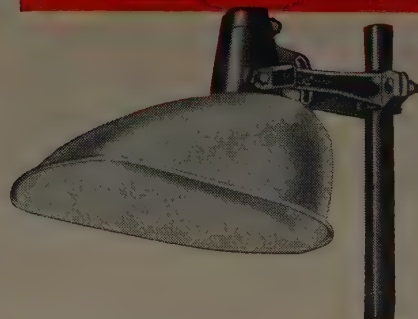


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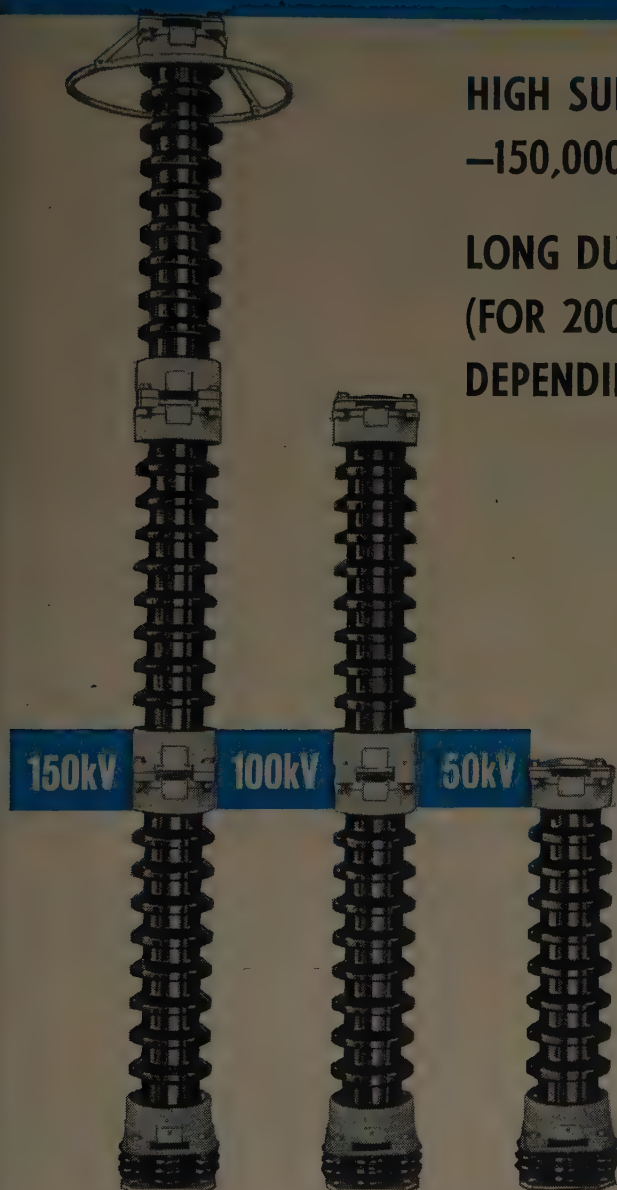
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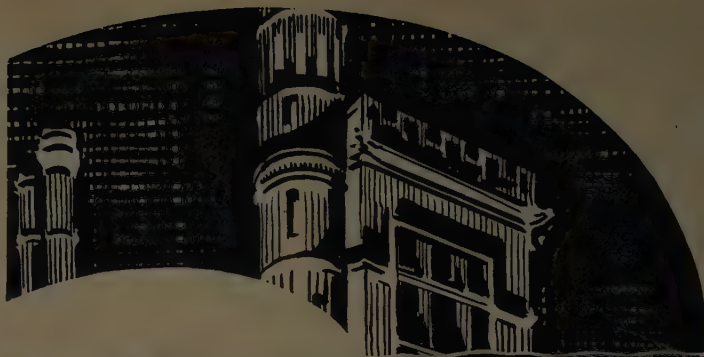
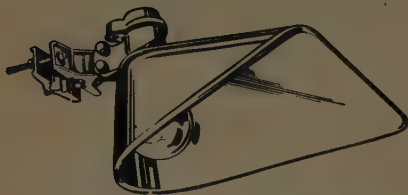


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List No. 890

'Realux' Overhead Mounting model, for G.L.S. or M.A./V. lamps.



YOUR FLOODLIGHTING PROBLEM

List No. 940

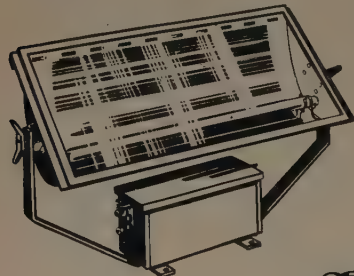
Downward lighting Sodium Lantern for wall or pole mounting.

**List No. 775**

'Festival' Lanterns for G.L.S. lamps from 100 watt to 1000 watt size.

List No. 920

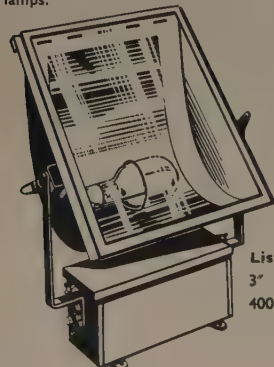
Telescopic Tripod for Floodlantern mounting.

**List No. 942**

Upward lighting Lantern for 200 watt Sodium lamp.

List No. 556

Narrow beam Projectors for 500 watt to 1,500 watt G.L.S. lamps.

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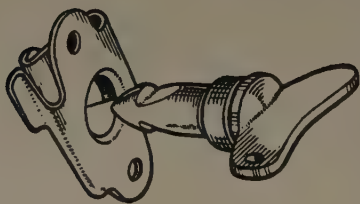
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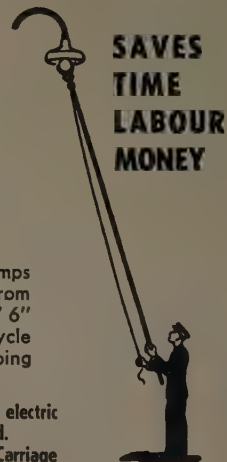
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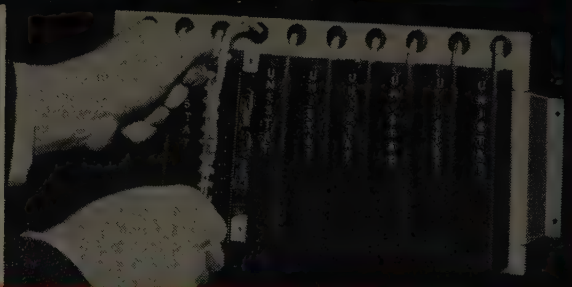
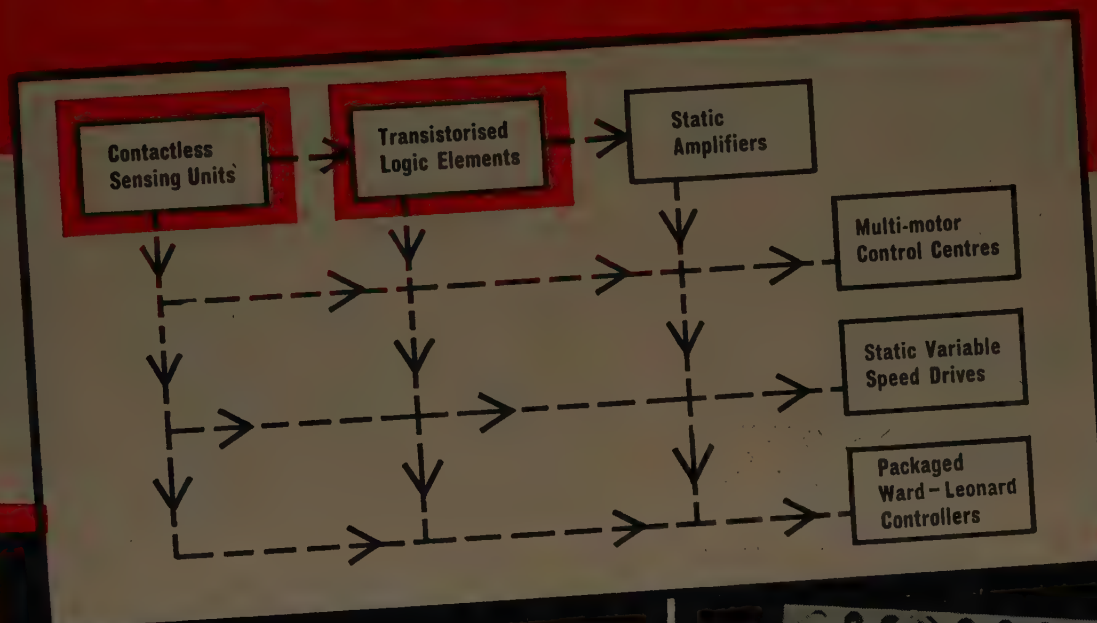


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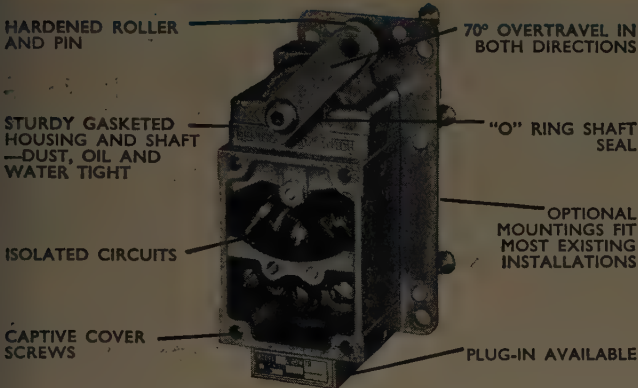
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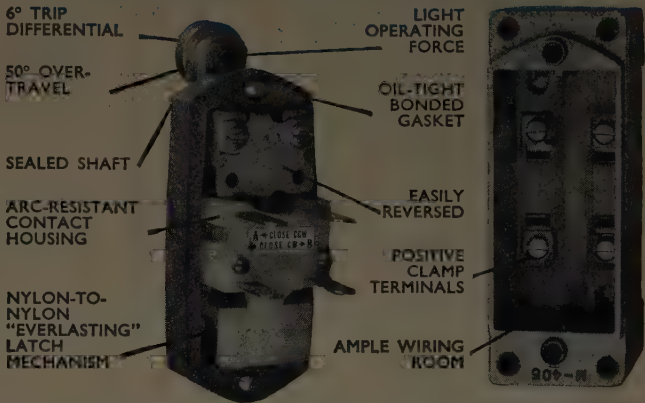


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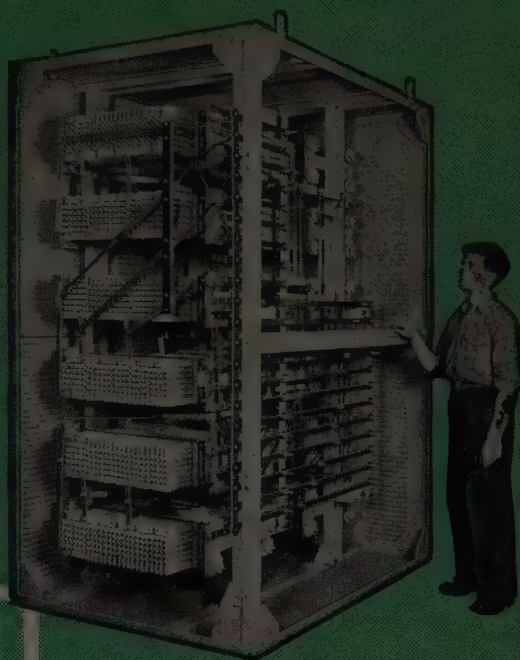


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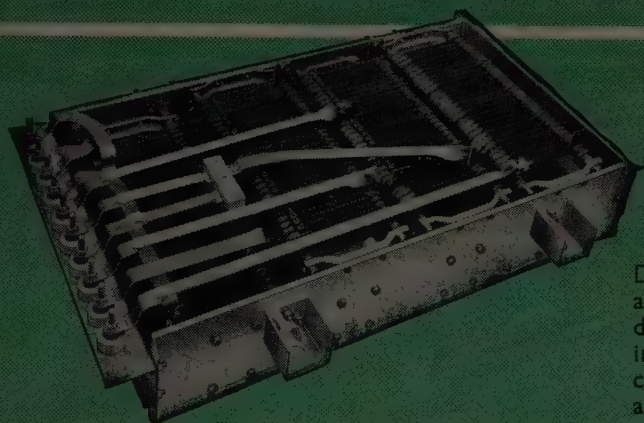
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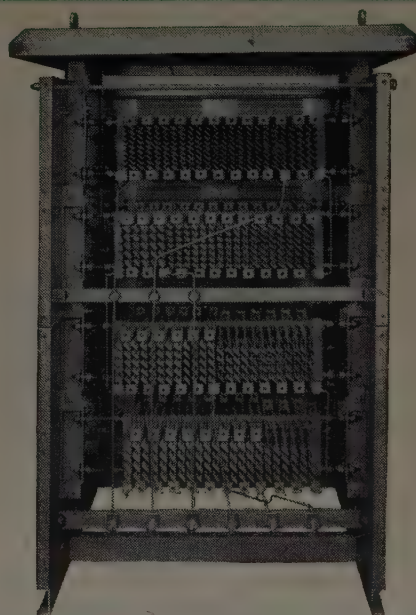
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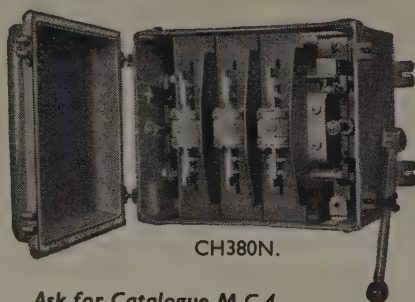


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ELECTRICAL REVIEW

Friday 20 October 1961 Volume 169 No 16

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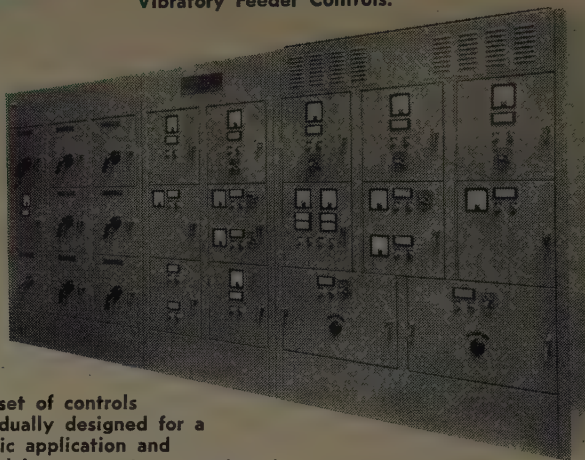
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ELECTRICAL REVIEW

20 October 1961 Vol. 169 No. 16 Established 1872

Distinguished Performance

THE successful design and construction of Calder Hall, the world's first full-scale nuclear power station, was an outstanding British achievement. This beginning of the nuclear power age was officially marked five years ago last Tuesday when Her Majesty the Queen opened the station. At that time, the design had not been fully proved, but now that the performance of the plant in service has exceeded all expectations, the significance of the event has become even greater. The original design and the subsequent construction has been proved to be very sound and this, together with the skill acquired by the operations staff, has resulted in improvements upon the designed performance.

The plant engineers are most proud of the improvement in the station load factor. Without any actual operating data to guide them, economic experts estimated the cost of nuclear power by assuming a 75 per cent load factor and a reactor life of 20 years. In 1960-61, the full power load factor at Calder Hall was 88 per cent; 6.8 per cent of the time was taken up by off-load refuelling and 2.3 per cent with experimental work. Thus, with their on-load refuelling equipment, the equivalent load factor at the civil stations now under construction would be 97.1 per cent, assuming that there was no experimental work. The 88 per cent load factor at Calder Hall is a remarkable achievement and it is interesting to note that while the first refuelling operation took eleven weeks, the same operation now takes only 24 days.

Since commissioning, the heat output of Calder Hall has been steadily increased to well beyond the original design expectation. By increasing the maximum fuel can temperature from 408°C to 418°C and the coolant flow from 1,960 lb/sec to 2,480 lb/sec, and by using computers to predict temperature distribution and absorber pattern, the designed heat output per reactor has been raised from 180 MW to 225 MW (an overall increase of 25 per cent). This has meant that in addition to an initial improvement in output from 21 to 23 MW for each of the two turbo-generators per reactor, four of the eight turbines are to be rebladed to increase set capacity to 27 MW. Fortunately, the generators require no modification. However, there will still be some surplus steam and this will be used next year for space heating in the Windscale works. The cost of steam from the present conventional boiler plant at Windscale is £1 per ton; the cost from Calder Hall will be 13s per ton.

To prove fuel element performance, some standard elements have now been in No. 1 reactor for four years, giving a maximum irradiation of

3,900 megawatt-days per tonne. (It is hoped to achieve 3,000 MWd/tonne in magnox civil reactors.) There have been only five or six can failures in all at Calder Hall; none of these has occurred since a new testing technique has been employed. This involves dropping the reactor pressure shortly after a new charge has been introduced. If there are any small holes in the can welds, then the gas, which has been forced in under pressure, escapes and is detected. There is so little dust in the gas circuits that the filters are now used only for a short period after refuelling.

CONFIDENCE AT CALDER

Since Calder Hall is the operational prototype of the civil magnox stations, it has been used for many experiments connected with the nuclear power programme. Civil fuel elements have been tested for life, deformation due to creep, and rattling, and graphite samples have been examined. Temperature cycling of fuel elements has been checked by oscillating adjacent control rods up and down 30,000 times. In this case, an in-pile experiment was necessary since an out-of-pile test could not simulate the highest temperature being within the uranium bar itself.

The most interesting experiments were connected with checking a computer programme to predict reactor time constants. A complete charge was allowed to stay in No. 3 reactor for two years, giving an average irradiation of 1,000 MWd/tonne, a large amount of plutonium being formed. The doubling times for disturbances were checked and the computer programme was modified. The acid test of the theory, the computer programme and the reactor was when it was decided to see what happened when the blowers were tripped deliberately. A reactor, with a fairly new fuel charge, was brought up to half power, about 90 MW (heat). All blowers were then shut down and the fuel temperature rose by 130° to 425°F in 1½ minutes and then began to drop slowly. The computer prediction was that there would be a rise of 123°, only 7° below actual conditions.

REACTOR LIFE

The results obtained at Calder Hall show that there is reason to believe that the reactors will last for at least their estimated life of 20 years. A Wigner release has not yet been found to be necessary and the likelihood is decreasing with time. If it does become necessary, nuclear heating will not be used. The coolant will be heated electrically after all fuel has been removed from the reactor.

Although Calder Hall is a dual-purpose station, designed to produce plutonium and generate electricity, it is subject to the same operating conditions as a conventional base-load power station. If generation targets are not maintained, penalty clauses take effect. On one occasion grid supplies were lost and Calder Hall was the only station which was able to supply the local consumers in Cumberland. Lightning was the cause

of this interruption to grid supplies and at the time some of the units at Calder Hall were operating on full load, while others were only on half load. The surge tripped out those generators on full load while those on part load withstood the shock. Since then, it has been the practice to reduce load when lightning storms are imminent.

LIGHTING TECHNOLOGY

The object of the Illuminating Engineering Society as laid down in its Memorandum of Association is, amongst other things, to promote the art, science and technology of lighting. This it most certainly has done throughout the sixty or so years of its existence and many of its outstanding contributions to lighting technology were described by Mr. W. T. Souter last week when he delivered his inaugural address as president of the I.E.S. For many years lighting engineers concentrated on ensuring that an adequate quantity of light was provided for a particular task and although some consideration was given to the quality of illumination this was regarded as of secondary importance.

Now that the need for an adequate quantity of lighting is recognised and illumination levels are on the increase, much more attention is being paid to quality. The efforts of the Society in dealing with glare are outstanding and, in fact, the glare data in the latest I.E.S. Code is recognised all over the world as a major contribution to lighting technology. Now reflected glare is being studied, as also is the wider problem of general brightness patterns, but it may be some years before a satisfactory and convenient technique is evolved which will enable lighting engineers to design the most suitable brightness values in all areas of a room which together comprise the visual field.

SAFE AND SOUND

As the British Electrical Approvals Board for Domestic Appliances gets going, and its scope expands, more and more work will fall upon the E.D.A. Testing House at Leatherhead. This establishment, which will be responsible for most of the B.E.A.B. testing, has just been extended, as we report in this issue (page 613). Hitherto a great proportion of its work has been on electric blankets (and their name is legion); now the other portable appliances are likely to take up more of the time and effort of the Testing House.

E.D.A. has actually been party to another approvals scheme for some years: that operated by the Ministry of Housing and Local Government for the guidance of local housing authorities. As the appliances in the periodical lists published under this arrangement have already been tested by E.D.A., they will automatically be eligible for the B.E.A.B. approvals mark upon payment by the manufacturers of the appropriate fees. The Testing House will continue to examine prototypes for manufacturers who wish to have an assurance of the safety and soundness of their new appliances from an independent body before going into full production.

Transformer Oil Maintenance

By J. A. C. GUILD*

This article records the results to date of an investigation which has been undertaken to ascertain whether the insulation values of 120 of the South of Scotland Board's 132 kV transformers had deteriorated after 30 years' service. The author discusses various aspects of oil maintenance aimed at ensuring long and reliable transformer life

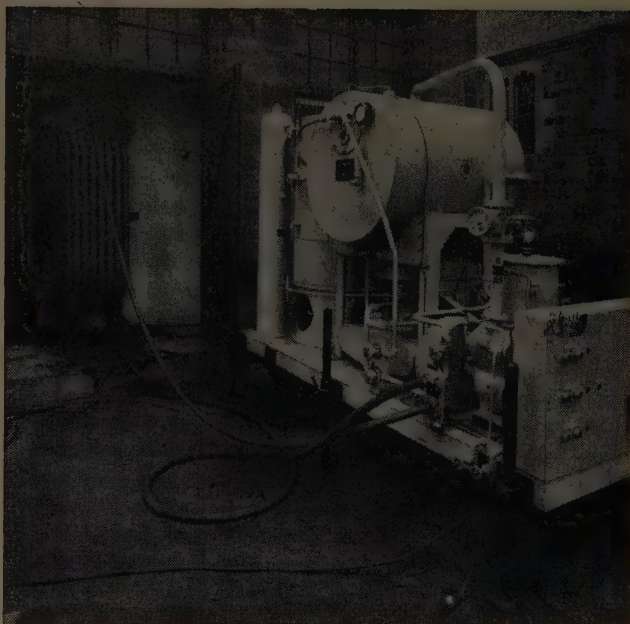
THE majority of the 120 132 kV transformers operated by the South of Scotland Electricity Board were installed in 1928 and first energised in 1929. Over the years there has been, inevitably, deterioration of the oil and of the insulation in those transformers. A very high standard of maintenance has been enforced but, in spite of this, deterioration still goes on, even though a grid transformer in normal use is not subject to large and sudden variations in load or to extremes of temperature variation. A few years ago the problem was examined with a view to improving oil and insulation conditions. Constant and regular checks were made of electric strength, acidity, resistivity, water content and flash point of the oil and insulation resistance values of the windings to earth and to each other. These results, when correlated, indicated in no uncertain way that active measures would have to be taken if the life of these units was to be prolonged and serious fault conditions avoided.

The oil for these transformers was supplied by the four major electrical insulating oil suppliers operating in Great Britain, thus ensuring a high grade of oil being initially obtained. To this fact, together with a high maintenance standard, can be attributed the low level fault incidence. It is also true to say that no 132 kV transformer fault was ever caused by a defect in the quality or maintenance of the oil used.

Apart from the normal increase in acidity and dissolved water content, the main causes of oil deterioration were shown to be caused by contamination from insufficiently cured copal varnishing of oil pipelines and degraded oil being accepted for processing from other sources. The tracking down of these sources of contamination took many months and as many more to find a cure without having to scrap thousands of gallons of oil.

Sludge Formation

A central oil handling plant under the control of a member of the staff trained for the work would be of real value, because it is unreasonable to expect all members of the various section staffs, whose interests are so diverse, to be experts in oil handling. It was shown that a sludge could be formed which was soluble in oil at about 80°C, and could be successfully removed only by a long process of cold filtration. In some very old 132 kV transformers sludge is known to have formed and collected in quite high volumetric concentration. Remarkable as it may seem, this fact was revealed through the quite inadvertent switch-

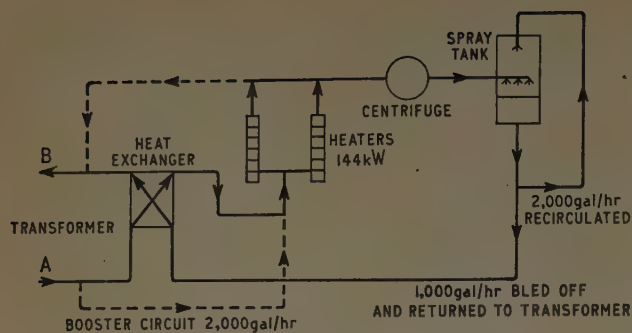


Streamline high vacuum portable oil filtration unit in use with a 1,000 kVA, 11 kV/440 V transformer having an oil capacity of 357 gal

ing on of the oil pumps on these transformers thus shifting the concentration of sludged oil. Electrical tests of oil from these units have substantiated this theory.

Close control has always been maintained on oil in the Board's transformers. Acidity tests are carried out regularly and it has been found that when the acidity value is between 0.5 and 1 it is advisable to keep the oil under observation and, if possible, filter it. When values are found to be in excess of 1 mg KOH/gm then works reconditioning is advisable or the oil should be discarded. Resistivity determinations, related to the figures and curves originated by Dr. J. S. Forrest, of the Central Electricity Research Laboratories at Leatherhead, have proved of inestimable value in assessing oil condition. An increase in the quantity of water in solution may be expected as oil ages, and in the normally maintained 132 kV transformer, the value may reach 50 to 70 p.p.m. after 20 years' service. A method of dealing with this water content is discussed later in this article. It is felt

* Senior Assistant Engineer, South of Scotland Electricity Board Headquarters.



Typical layout of high vacuum oil filter plant

that, with reasonable care, and with the advances made in transformer oil technology in recent years, a very high standard of oil maintenance can be attained.

In dealing with insulation resistance values of 132 kV transformers it must be remembered that the real criterion is the picture presented by a comparison of test figures taken over a lengthy period under similar conditions of temperature and humidity. A large decrease in insulation resistance value obviously demands an immediate investigation, but it will be found, on the whole, that decline in insulation resistance value is very slow. When this figure is related to oil condition it becomes possible to determine whether the transformer should be serviced in part (oil change only) or as a whole (complete unloading and drying out). The second of these operations is most expensive and does present some difficulty as grid transformers normally run on a high load factor and cannot easily be removed from the system. This problem has been solved satisfactorily by bringing to site high vacuum oil plants which not only dry and de-aerate the oil but also, by making available a residual solvent capacity for water in part of the oil, dry out the windings too.

Plant Hire

The major electrical insulating oil companies are in a position to hire plant at a cost of £50 per day. The plant comprises a mobile processing unit with a separate laboratory. A typical plant is schematically illustrated in the accompanying diagram. A full staff to operate the plant and the laboratory 24 hours per day is included in the fixed price. Two plants available require separate electrical power supplies (three-phase, 440 V, 90 or 170 kW). Two other plants have their own self-contained power units. An additional charge is made for this facility.

Before commencing operations on any transformer, it is essential to check all main lid and inspection cover gaskets for tightness so preventing the ingress of partly moist air. It has been shown that normally five to seven days per unit of 30 MVA is sufficient to complete the cyclic number of circulations required. At the end of this period the water content of the oil will have been reduced to about eight parts per million. Precipitated sludge is eliminated, the oil resistivity improved and the electric strength raised at least to the level required by B.S. 148 for new oil.

Great reliance is placed on resistivity values because this test is an excellent way of detecting the presence of small quantities of water in suspension if the measurements are made at different temperatures. This test is more sensitive than the usual crackle test but it cannot

detect the presence of dissolved water where this is less than 15 parts per million. More complicated and exacting methods are available but for these very reasons can be applied only where adequate laboratory facilities are available.

In using these plants in a normal grid substation, it will be found advantageous to interrupt the process at the end of the third day, reconnect radiators and cooling banks and put the transformer on commercial load. This procedure is quite safe as the oil in the first three days of circulation is completely de-aerated and dehydrated. By doing this for two or three days a certain amount of heating is applied to the core and windings, thus releasing moisture from both to be absorbed by the oil. On reconnection of the high vacuum plant, this moisture is removed from the oil.

Means of measuring the amount of moisture withdrawn are available with each plant. The quantity varies with each transformer's initial condition and usually can be measured in pints for transformers 20 to 30 years old. It has been shown that the insulation resistance values can be increased by 130 per cent. It is felt that this value could be bettered if only a convenient method of heating the core midway in the filtration process could be devised. This problem is being studied by a colleague.

That this method of processing old transformers brings benefits far and away beyond those derived from any other method (short of unloading) has been amply demonstrated. Its application to spare transformers in storage shows that when a unit fails and has to be replaced by a spare transformer ex storage, no major internal work has to be done to the replacement transformer. A demonstration of this has just been given by dismantling and replacing one 30 MVA unit in eight days against our normal time of 28 days.

The initial filling of new transformers should also be done, using the high vacuum plant, as this will give the oil that final "polish" and also remove any surface moisture and contaminants that may have been introduced during erection. The dehydration and de-aeration of the oil is thus assured. Ever-increasing importance is being attached to this method, especially in the filling of 275/132 kV transformer units, so much so that it is hoped that a clause to this effect will be introduced into purchasing orders.

The question of using this type of plant on distribution transformers has received consideration. It is felt that economically there is a limit in size (gallons) below which the high vacuum unit, as described above, should not be used. Accordingly, an experiment has been carried out using a 250 gal/hr portable high vacuum plant on a 100 kVA distribution transformer stated to be in poor condition. Circulation of the oil at appropriate temperatures was carried out for four days continuously. The final results show that the electric strength of the oil was increased from 35 to 48 kV. The insulation resistance of the h.v. winding to earth increased by 35 per cent, the l.v. to earth insulation resistance increased by 35 per cent and the h.v. to l.v. insulation resistance increased by 170 per cent. These are remarkable improvements and justify confidence in plant of this type. The resistivity value of the oil was also subject to considerable improvement and was brought up from "bad" to the top limits of "fair" on the Dr. Forrest resistivity curves. This type of plant

makes no claim to improve acidity values, but nevertheless a small improvement is always obtained. Frequently cable end boxes, tap-changer selector cubicles, low oil volume circuit-breakers and oil circuit-breakers up to 33 kV require circulation or refilling. It is a serious disadvantage to be forced to use a large plant for these purposes so we now use a small 100 gal/hr cold filtration unit. This can be carried in the boot of an average car and can be moved from one position to another by two men. In remote districts, as in subterranean sites, this unit has a high practical value and also confers the advantages of cold filtration.

A typical example of the results obtained in using this Pn8 cold filtration unit is given in Table I, the oil being in a 90 MVA booster transfer switch tank:—

TABLE I		
	Oil before filtering	Oil after filtering
Air Humidity	49%	49%
Air Temperature	13°C	13°C
Oil Resistivity	18×10^{12} ohm-cm at 20°C	34.2×10^{12} ohm-cm at 20°C
Oil Dielectric Tests	Withstand 40 kV for 1 min	Withstand 40 kV for 1 min
Carbon Content	Breakdown 54 kV Heavily loaded	No breakdown at 80 kV Nil

Contamination and Compatibility

As mentioned above, contamination of oil can be serious and it has been found that quite small proportions of sludge or varnish in suspension can reduce the electric strength to below B.S. requirements, and experience has shown that contaminated oil of this nature should be isolated from other oils.

During the investigation into contamination, many

examination to one of the laboratories. It should be stressed that neither laboratory had any knowledge of the identities of the samples, which were marked only with code letters.

The results are set out in Table II below and they show, bearing in mind the complexity of the test, a very satisfactory degree of agreement between the two laboratories. It will be noted that in samples A, B, C and D of the 50/50 mixtures, not only is the sludge value higher than that of either constituent, since the highest value for an unmixed oil is under 1 per cent, but it is also higher than the maximum of 1.2 per cent permitted by B.S. 148:1959.

The significance of this finding is evident in that some concern must be felt about the desirability of mixing oils from different sources. However, another point emerges that should engage the attention of the standardising authorities. Clause 2 of B.S. 148:1959 contains the following statement: "Oils complying with the requirements of this standard are considered to be compatible with one another and can be mixed in any proportion; this does not necessarily apply to inhibited oils." The implication of this statement is that mixtures of two or more oils, which individually comply with the specification, should meet the specification in every respect, an assumption which the tabulated results show not necessarily to be valid. As a result steps are now taken to have permanent labels attached to all transformers naming the oil supplier.

To continue on the same theme, it is worthy of note that in this country there are some hundreds of transformer cable end boxes the top half of which is filled with elec-

TABLE II

50/50 Mixed sample	Lab. 2 Sludge value	Lab. 2 Filtrate acidity	Lab. 3 Sludge value	Lab. 3 Filtrate acidity	Lab. 3 Tests of five straight samples		
						% Sludge	Filtrate acidity
A	1.32%	1.75 mg/KOH/g	1.39%	2.16 mg/KOH/g	Supplier V Supplier W Supplier X Supplier Y Supplier Z	0.95 0.97 0.73 0.77 0.80	1.52 1.42 1.33 1.42 1.25
B	1.45%	1.81 mg/KOH/g	1.56%	2.1 mg/KOH/g			
C	1.38%	1.96 mg/KOH/g	1.39%	1.95 mg/KOH/g			
D	1.4%	1.95 mg/KOH/g	1.48%	2.1 mg/KOH/g			
E	0.92%	1.26 mg/KOH/g	1.00%	1.43 mg/KOH/g			
F	0.99%	1.45 mg/KOH/g	1.07%	1.64 mg/KOH/g			
G	0.96%	1.51 mg/KOH/g	1.01%	1.43 mg/KOH/g			
H	0.81%	1.27 mg/KOH/g	1.00%	1.5 mg/KOH/g			

samples were examined and the effects of mixing old oils was studied. This investigation was then extended to cover the mixing of new oils and some unexpected and significant results were obtained. These indicated that the mixing of new oils can result in an oil which is actually higher in sludge value than either of the constituents and that the mixing of two new oils, each of which meets B.S. 148 in every respect, can produce an oil which fails to meet the very important oxidation stability requirements of the specification.

To check these findings, a number of samples, each representing a mixture of equal volumes of two new oils, were prepared in duplicate. One set of samples was sent to each of two competent laboratories for submission to the oxidation test of B.S. 148:1959, involving the determination of the sludge content after oxidation and of the acidity of the oxidised oil. In addition, as a check on the compliance of the oils used in the mixtures with the B.S. Specification, though there was no reason to doubt this, the individual oils used in the mixtures were sent for

trical insulating oil and the lower half with solid or semi-viscous compound. The intercompartment bushings have been known to leak permitting oil to mix with the compound. The oil and compound separately have high electrical strength value, but when mixed give a resultant value sufficiently low to give justification for repairing the leak and remaking the cable end boxes.

Mass Transfer Phenomena

THE Institute of Physics and the Physical Society is arranging a conference on "Diffusion and Mass Transport in Solids" to be held in the University of Reading on 10th and 11th April, 1962. It is provisionally proposed to hold sessions on general theoretical aspects of diffusion in solids and on diffusion and related mass transfer phenomena in metals, in oxides and covalent materials and in strongly ionic solids. Correspondence regarding the programme should be addressed to Dr. B. L. Evans, J. J. Thomson Laboratory, Whiteknights Park, Reading.

Electricity and Education in Africa

In his presidential address to the Association of Supervising Electrical Engineers this week Sir Willis Jackson spoke of two aspects of his recent visit to Uganda, Kenya and Northern and Southern Rhodesia which he hoped would convey some little impression of the achievements which electrical engineers—mainly British—have made in these countries, and of the varied complexity of the educational problems which these countries are facing in the present stage of their evolution

IN Uganda the first public electricity undertaking started in 1935 with two small wood-fired generating sets to supply Kampala and Jinja. By 1960 the system had grown under the auspices of the Uganda Electricity Board to one supplying 362 million kWh to over 30,000 consumers—including a bulk supply by 132 kV transmission line of 160 million kWh to Kenya—at a total capital expenditure of £28.7 million. The major installation of the system is the Owen Falls hydro-electric station, with a proposed total installed generating capacity of 135 MW, situated within a mile of the source of the Victoria Nile. The future potentialities of this stretch of the Nile alone are estimated at a further 2,000 MW.

In Rhodesia the first stage of the Kariba project on the Zambesi provides for a south bank installation of 600 MW to which is to be added 900 MW on the north bank. In potential supplementation of this grandiose achievement it is estimated that the Zambesi affords the possibility of a further 3,000 MW and the Kafue River, a tributary of the Zambesi, a still further 2,000 MW.

The engineering administration, planning and supervision of the electricity supply and telecommunication systems, and of the industry, of these countries is almost wholly in the hands of men of British origin. It was therefore disturbing, even in respect of maintenance of the present situation, let alone of the prospects of further development, to read in the annual report of the Uganda Electricity Board for the year 1960:—

“A considerable number of the expatriate staff, most of whom had been recruited from the United Kingdom, intimated during the year their intention to leave Uganda and return to their own country. Primary reasons given were the uncertain future in the Protectorate and the greatly improved service conditions in the United Kingdom. The number of expatriates dropped by 25 (from 147 to 122) during the year and a further 14 are known to be leaving during 1961. Only one expatriate—a communications technician—was recruited during the year.”

Sir Willis's detailed analysis of the numbers of students attending courses in engineering at the professional and technician levels in the colleges of East and Central Africa made it abundantly clear that there was no early prospect of vacant posts being adequately filled from local sources. He expressed anxiety lest the vacancies left by withdrawing British engineers, and the new posts which were likely to arise, might come to be filled on independence by men

of other nationalities to the ultimate detriment of our influence and business prospects in the electrical field. He asked whether it would not be wise national policy for our public services to organise a scheme for the secondment of staff to posts in the developing countries as a matter of urgency.

In his educational analysis Sir Willis remarked on the seriousness which attaches to the neglect of attention in the developing countries generally to the education and training of technicians, in favour of provisions at the professional level. Fortunately, though ten years too late, steps are now being taken in most of these countries to correct the deficiency, but again a major difficulty is the shortage of teaching staff. He cited the case of the Kampala Technical Institute, the teaching staff of which includes 30 of British origin. Two of these had recently submitted their resignations, and several others were contemplating the same step, notwithstanding their awareness that the expanding student numbers would require an increase of teaching staff over the present figure by 20-25 in the next few years, and that these could not possibly come from local native sources. The principal had failed to make a single recruitment from the United Kingdom during the past 2½ years, and it was not surprising that he was probing possible non-British sources. Sir Willis remarked that a well-organised scheme for the overseas secondment of technical teachers from this country was essential, and said that the Kampala situation “is illustrative of a widespread need, and of a challenge, to which a vigorous and speedy response is of vital importance not only to the developing countries concerned but also to the not-so-long-term economy of this country.” He was pleased to be able to say that some progress was being made in the formulation of such a scheme.

He also emphasised the urgent need for our industry and public services to afford facilities for good practical training to an increasing number of young people from overseas, at the technician as well as the professional level. Again referring to the Kampala Technical Institute by way of illustration, he spoke of the steps being taken by West German and Italian companies to attract students to their countries for training. This, he said, touched on what he believed to be the weakest spot in our plans for the further development of our own system of engineering education, and added emphasis to the urgent need for our industry to augment its present training facilities.

TESTING DOMESTIC APPLIANCES



General view of the E.D.A. Testing House at Leatherhead showing the extension on the right

Extension of the E.D.A. Leatherhead Establishment

JUST after the war the British Electrical Development Association set up a small laboratory near its London headquarters for the testing of domestic electrical appliances in conjunction with the British Standards Institution. The idea was to tell manufacturers, confidentially, if samples of their products submitted for test were unsatisfactory from the safety aspect.

Later it began to provide a service to the Electricity Boards by reporting upon the appliances which they proposed to sell at their service centres. This work soon outran the available facilities and in 1952 a site was found at Leatherhead, Surrey, for the erection of a more commodious Testing House. One outcome of this was the preparation of a periodical list of approved appliances for the guidance of local authorities. Then, in 1956, the Testing House undertook tests for the British Standards Institution in connection with the B.S.I. "Kite Mark" scheme for electrical appliances. This led to a great deal of work in connection with electric blankets and the Testing House can claim to have raised the safety and reliability of these to a considerable degree.

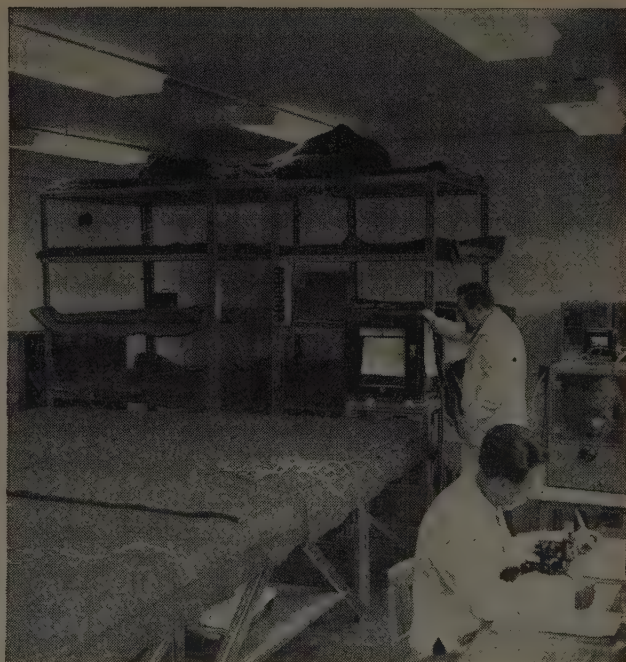
Special investigations have also been made for the various E.D.A. Technical Committees, one of which was a survey into electrical ignition of solid fuel fires, leading to recommendations upon the most promising line of action. Another activity has been the testing of and reporting on prototypes of appliances sent in by manufacturers before embarking upon quantity production.

The number of appliances tested annually rose from 230 in 1954, the first full year of operation of the Leatherhead laboratories, to 568 last year, and it became clear that extensions were needed, particularly as the E.D.A. laboratories were to form the principal testing establishment for the British Electrical Approvals Board.

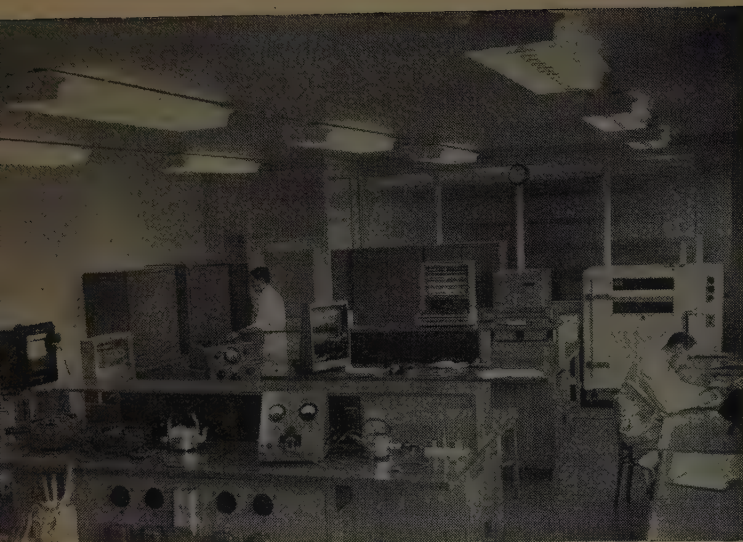
Originally, the Leatherhead building consisted of two

single-storey wings, for laboratories and stores, and a small administrative section above their junction. In 1957, the apparatus life-test room was extended. The much greater extensions just completed have added three new laboratories, with offices, etc., as a second storey over the existing laboratory wing, and a photographic department at the rear of the building. By the present extensions, over 4,000 sq ft has been added giving a total floor area of about 14,000 sq ft.

The principal laboratory is largely a replica of the



This blanket testing laboratory is part of the extension



Portable heating appliance laboratory

original portable apparatus laboratory, but it incorporates a number of improvements which experience has shown to be advisable. As in the case of the original laboratory, all supplies are taken to fixed island benches so that connection can readily be made to variable voltage supplies, both direct from the mains and through isolating transformers, stabilised supplies also being available where constant voltage is required. Connection to the d.c. battery supplies can be made through a plug and socket exchange board enabling any voltage to be selected at will. A number of 24-way potentiometric recorders are mounted on one wall of this laboratory and connections for these are provided at each working point.

The provision of this new laboratory has enabled the work of the Testing House to be split into three main groups—portable heating appliances, portable motor-operated appliances, and large appliances.

The testing of electric blankets has always been under-

taken by the portable appliance group and, because of their similarity, carpet heaters are also handled by that group. By reason of the great increase in this work it has been necessary to devote one of the new laboratories to the testing of blankets and carpet heaters. Here there are a number of working benches specially adapted to the testing of blankets and one large island bench can be extended to provide a working surface large enough to accommodate a 12ft by 9ft electric carpet or underlay. In addition to the mechanical endurance test apparatus, there are a number of "bunks" on which blankets are placed between felt pads and allowed to operate on over-voltage during their endurance tests.

The remaining laboratory is a relatively small one devoted to the testing of switches, thermostats and similar components of the tested appliances.

The photographic department, which incorporates a new X-ray room, also includes many features which experience in the earlier studios had shown to be desirable. The new room is 15ft high and is much loftier than the old room. This has enabled the incorporation of a gallery so that equipment which requires to be photographed from above can conveniently be dealt with. The lighting equipment is carried on a grid suspended from the ceiling so that the required lighting combinations can be set up merely by operating switches. Two large and fully equipped darkrooms are provided.

The accommodation in the original part of the building has been reorganised and a new temperature and humidity control room has been provided, primarily to extend the facilities for testing refrigerators and water heaters.

The new extension has been built with an eye to maximum flexibility. Steel partitioning is used so that the size of the rooms can be altered as the emphasis on the various sections of the work changes. Feeders, both a.c. and d.c., are taken round the whole extension in trunking so that new supplies can be brought in as required with the minimum of disturbance. Water, gas and compressed air supplies are also available.

British Railway Electrification

A CONFERENCE organised jointly by the British Transport Commission, the British Electrical and Allied Manufacturers' Association and the Locomotive and Allied Manufacturers' Association of Great Britain was held in London in October last year to discuss the electrification plans for British Railways at high voltage and industrial frequency. The conference was attended by representatives of over 40 different railway administrations from countries throughout the world and the proceedings have now been published in book form. Apart from being a record of the conference, the book represents one of the most comprehensive works obtainable about railway electrification on the single-phase 50 c/s system and is the first review of British techniques in this form of railway traction to be published.

The book includes a foreword by Sir Brian Robertson, chairman of the British Transport Commission at the time of the conference, his opening address to the delegates and the full text accompanied by illustrations and diagrams of the 42 technical papers which were prepared by engineers from both the railways and industry. The

subject is covered in six main sections dealing with application of the 50 c/s system, locomotives, multiple-unit trains, the power supply, the overhead equipment and civil engineering aspects, a.c. traction research, and signalling and telecommunications. The book also reports the discussions which took place and the authors' written answers to the more involved technical questions raised.

Since the conference was held, 600 track miles of 50 c/s electrification has been brought into service in this country and by 1966 through electrified services should be operating from London to Liverpool and Manchester. It is well known, however, that certain difficulties were encountered in the operation of some multiple-unit trains and a note about these problems and the way in which they are being overcome has been included in the proceedings.

Copies of the 496-page book, "Railway Electrification at Industrial Frequency," containing about 120 photographs and 175 diagrams, may be obtained from the Publicity Officer, British Transport Commission, 222, Marylebone Road, London, N.W.1, price £5 each.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

"Dowsing" for Buried Cables

I AM always surprised at the astonishment and disbelief which greets any mention of this subject. While not being an electrical engineer, I am familiar with a very similar effect. When I drive my car beneath overhead wires I get interference with the reception on my car radio. I understand that this is due to the field set up around the overhead cable by the passage of current along the wire and that this has a local effect on my wireless as I pass below.

Now any reader of popular medicine or electrical history is aware that the muscles of the body are controlled by electrical pulses along the nerves. We need only suppose that these signals can be affected very slightly by the surrounding electrical field to account for dowsing. In the dowsing position, the long muscles of the forearm are held in tension against the spring of the dowsing stick and any slight variation in the pull of these muscles will be greatly magnified in movements of the end of the stick. Reversing the usual analogy, we may suppose that the flow of water in an underground stream is similar to a flow of current in a wire and will similarly affect the electrical field in its vicinity. As the dowser passes over the stream, this change in field interferes with the electrical messages to and from the brain. Due to this interference, the brain cannot equate the feeling of pressure of the stick on his hand with the necessary counterbalancing force in his arm muscles and the stick cannot be held firmly but turns in the dowser's grasp.

Sensitivity to field discontinuities of this nature will vary from person to person and can probably be developed by training. At school we had a master who used to take his class out every year, supply them with two whale-bone rods joined at one end by a rubber bung and show them how to hold them in the dowsing position. Together with a surprisingly large proportion of my fellow pupils I felt the rather eerie effect of the rods twisting involuntarily in my hands at certain points on an otherwise ordinary golf course. I must admit that I have made no effort to use or develop what seems to be a fairly common attribute, but it is interesting to hear that the effect can be used to find buried cables. This would seem to provide a little support for this theory, particularly if the cables are more easily found when they carry current than when not.

I imagine that it would not be impossible for some medical reader to measure directly the nerve currents involved in holding the rods in the dowsing position and to see if they were affected by alterations in the surrounding electrical field and so get direct evidence for or against this theory.

Similar but smaller field discontinuities probably account for the claims of highly sensitive dowsers to be able to detect buried metal and ore deposits. There is no reason why these field discontinuities should not be detected by far simpler electrical equipment than the human body and, indeed, such measurements form the basis of

the expanding science of geophysics which aims at discovering and delineating geological formations by mapping field changes, using magnetic, gravimetric, radioactive and electrical methods. In both dowsing and geophysics the effects noted require expert interpretation, but the geophysical methods have the advantage that the effects are noted objectively and are therefore capable of more extensive study than the more subjective impressions of the dowser.

Being neither engineer nor doctor, I would be glad to hear the views of your more expert readers on this theory of dowsing.

Fundao, Portugal. I. R. M. CHASTON, A.R.S.M., B.Sc.

IN connection with the letter in your 29th September issue from Mr. C. Foster referring to "dowsing" for buried cables, it may interest readers to know that whilst engaged upon the conversion of an old cottage, the builders we had employed used this method to trace the main water supply pipe, with complete accuracy. As the pipe took an extremely tortuous and unforeseen route, there can be no doubt that the tracing of this pipe was solely due to this strange phenomenon.

London, E.C.1.

P. E. H. WEBB

(Anglo-American Vulcanised Fibre Co., Ltd.).

"Mixed" Socket-Outlets

MR. EVERITT (*Electrical Review*, 6th October) certainly does not fully realise that a little knowledge is dangerous. For his information the 13 A plug and socket ring main installation provides for local protection of circuits by having the plug fitted with its own fuse. By providing any other type of unfused plug he destroys the very purpose of the installation.

I fully agree with Mr. Brealey's view, and feel it is time that some form of legislation was introduced to protect the public from such equipment being marketed. Undoubtedly it is a temptation during this transition period to buy at the prices quoted. The point which puzzles me is why there should be "loopholes" when there are such organisations as the B.S.I., I.E.E., N.I.C. and the supply authorities, all of whom are doing good work in trying to raise the standard of electrical services and cut down the possibility of accidents and yet ensure the full benefits which the use of electricity offers.

I am rather interested to know what the reaction of the fire insurance companies would be in the event of a fire claim in such circumstances.

Seaton Carew.

EDWARD STEWARDSON (R.A.F.).

B.E.A.M.A. GOLDEN JUBILEE

The British Electrical and Allied Manufacturers' Association is celebrating its fiftieth anniversary and next week's issue of the *Electrical Review* will include articles on its history and future

Utilisation Research

By H. G. TAYLOR, D.Sc.(Eng.), M.I.E.E., F.Inst.P.

Last week Dr. H. G. Taylor, director of the Electrical Research Association, delivered his inaugural address as chairman of the Utilisation Section of the Institution of Electrical Engineers. In this article Dr. Taylor summarises his address which was entitled "Research in the Field of Electricity Utilisation"

THE introduction of the hammer mill to British farms for grinding grain and enabling the farmer to make his own feeding stuff was due to the Electrical Research Association, which studied the problem in conjunction with the Institute for Research in Agricultural Engineering. This was one of the first applications of automation on the farm and the elimination of need for human attendance immediately had a significant effect on costs. These machines are small and cheap and provide an attractive load for the supply undertakings. Furthermore, such machines may be switched on automatically during the off-peak period if a preferential tariff is available. There are now some tens of thousands of these mills in operation on farms.

Hay Drying

The use of electricity for hay drying is another application which has made great progress, thanks to the work of the E.R.A. The British climate is suitable for growing hay, but not so good for drying it. Immediately after the war and following preliminary tests at the E.R.A. research station at Shinfield, experiments were started on about ten farms in various parts of the country. The supply industry collaborated. The technique is to wilt the hay in the field for a matter of hours to reduce the moisture content to about 40 to 45 per cent, and then dry it a further 20 per cent by blowing air through it in a barn.

After several years of practical tests, the quality of the hay so produced was found to be markedly superior due to the reduced protein and carotene loss and the increased value considerably exceeds the cost of drying. Moreover, artificial drying is often the only way of saving the crop. The method has "taken on" well; there are some thousands of installations in the country and the energy consumed can be a substantial proportion of a farm load. One Area Board reports an annual consumption of thirty million kWh for hay drying alone.

An improvement in this scheme is the multi-purpose dryer in which air at room temperature is first blown through the hay, followed by warm air for a short period. This is suitable when the hay is wetter than normal. This dryer is also suitable for drying grain in sacks or bales which are placed over holes in the barn floor above a plenum chamber.

In horticulture the principal applications of electric heating appear to be restricted to amateur greenhouse and hot-bed heating, and to propagation benches for professional growers. There is greater interest in the use

of electric lighting which influences photosynthesis and photoperiodism. With respect to the former, lighting may be used as a supplement or alternative to daylight and it is now possible to grow flowering bulbs such as daffodils and tulips with complete success in rooms without the use of any daylight. This means that cut flowers could be factory produced on a large scale under completely controlled conditions.

Control of the proportion of time for which a plant is exposed to darkness or daylight makes it possible to retard or advance flowering and recent developments have made it possible to bring chrysanthemums into flower at any time of the year.

The E.R.A. was one of the first organisations to do research on floor heating, having started by conducting practical tests over several years in six different types of buildings. The most important conclusion was that the heat energy required to maintain a given temperature excess in a building is often over-estimated. Of hardly less importance was the conclusion that in a block of flats unless special precautions are taken there can be a very considerable loss of heat to the room *below* the heated floor.

Good quality argon arc welding of aluminium is only achieved if a full loop is obtained on each half-wave of current. This can be ensured by use of the surge injector invented by the E.R.A. This stabilises the arc, enables a lower open circuit voltage to be used, gives better welding and eliminates the radio interference which occurs with other devices. The E.R.A. staff also explained the operation of the self-adjusting arc and showed that its performance could be greatly improved by using a power source with a flat characteristic.

Industrial Flameproof Equipment

Flameproof electrical equipment is today widely used in industry in conditions often much more hazardous than occur in mines. Certificates of safety are issued by the Ministry of Power on the advice of the Safety in Mines Research Establishment, but the Ministry was unwilling to continue to take this responsibility for conditions differing widely from those in coal mines, without further research being undertaken. The E.R.A. work in this field was therefore substantially stepped up a few years ago. Much new light has been thrown on the subject and today there can be great confidence in British equipment, but the research, as so often happens, has revealed nearly as many problems as it has solved.

ELECTRIC FIRE PRODUCTION

BERRY'S NEW BLETCHLEY FACTORY

BLETCHLEY, in Buckinghamshire, may seem to be a rather remote spot for a factory but evidently a number of manufacturing concerns do not think so for several have settled on an industrial estate there. One of them is Berry's Electric, Ltd., which has found Bletchley to be conveniently situated about mid-way between its Wembley and Birmingham factories which now feed the new establishment with the components of "Magicoal" fires for assembly there.

The area of the Bletchley factory is only 35,000 sq ft but by careful and economical layout it will add 40 per cent to the company's potential capacity. Enough ground remains available to double the present floor area in the near future.

As indicated above, the new works' is devoted practically wholly to assembling parts from the company's other factories. An exception is the production of log-effect fires for the American and other overseas markets. At this point we may mention that the company contributes a good deal to export trade, and in the best way—it sends



View of main assembly shop

out appliances in which the "added value" is a high proportion of the price received from the overseas customer. During a visit to Bletchley last week we saw cases labelled for transmission to all parts of the world, even to some places where it would be thought that fires could never be needed—Kuwait for instance.

Another piece of manufacture at Bletchley is the production of the realistic imitation fuel which is the characteristic feature of the "Magicoal" fire. Each bank of



The handsomely furnished staff restaurant



Much artistry is needed in the finishing of the "logs"

glowing coals is separately made. A rectangle of wire gauze is literally "knocked into shape" upon a former by a woman operator. It is then sprayed, covered with powdered glass and heated to consolidate the coating. After this it passes to another girl who applies a thick black paint which she artistically touches up to produce a resemblance to real coal. After further treatment the "coal" is ready for insertion.

Even more like the real thing are the "logs," which are very popular in America. The "bark" is applied by women workers who must already possess artistic ability or have it imparted by training over about six months.

In the meantime the framework of the fire has been assembled from "imported" steel parts, mainly by welding, sprayed, and passed through an infra-red oven. The heating elements and their reflector, switch and leads, and the flicker lamp and disc are inserted by nimble-fingered

girls. Then after testing the fire is immediately packed and dispatched.

Particular care is taken to make the conditions attractive and comfortable for the employees. In the works they have ample elbow room and the trays of parts and the tools are conveniently arranged. The décor is bright and the lighting very good. This applies equally to the shops, the canteens and the rest rooms. Mr. John Lunn, F.S.I.A., was responsible for the colour schemes and decorations. The building was designed by Messrs. David A. Wilkie & Partners and erected by Dawson & Son.

All the staff are encouraged to take an interest in the company and its affairs by being kept acquainted with news of home and overseas activities. They are the more favourably disposed because of the amount of individual work which goes into the fires; indeed so far as the fuel is concerned each fire has its own "personality."

THE I.E.S. AND LIGHTING TECHNOLOGY

When Mr. W. T. Souter delivered his inaugural address as president of the Illuminating Engineering Society last week he dealt with the Society's contribution to lighting technology over the past 50 years

THE influence of the Illuminating Engineering Society's activities on the development of the technology of lighting first became evident in 1912, only three years after the formation of the Society, when the Home Secretary first appointed a departmental committee to investigate lighting conditions in factories and workshops. A few years later the Society was asked by the London County Council to undertake an investigation into the possible causes of eyestrain in cinemas. The Society's recommendations were adopted by cinema licensing authorities throughout the country as also were later recommendations following the introduction of the current projection techniques. In these and similar ways the technical activities of the Society were applied to the public good.

During both the two world wars the I.E.S. was able to render valuable services to the country. During the last war the Society was concerned with the relighting of key factories where, perhaps for the first time, artificial lighting became recognised as an essential tool in achieving greater productivity. One of the most fundamental technical studies by the Society, which began in the inter-war years and has been carried on continuously ever since, is that relating to vision under different working conditions which made it possible to build a code of good lighting which has stood the test of time. The patient experimental work and studies by Lythgoe, Beuttell and Weston resulted first in the publication of simple recommended levels of illumination in 1936 and then to subsequent editions of the I.E.S. Code which found acceptance not only in this country but also in many other countries. As new experience and data became available new editions of the Code were published and though considerations of quality of lighting were introduced, the main interest in the Code was in the quantity of illumination needed for various tasks. However, factors con-

tributing to glare conditions in lighted interiors were receiving increasing attention from the Society and some measures for dealing with glare were introduced into the Code. In 1957, when the I.E.S. Technical Committee was reconstituted, it was recognised that glare had become a matter of major importance and a study panel was appointed to evolve a formula which would enable the practising lighting engineer to design an installation with the assurance that the resultant degree of glare would be within comfortable limits. The glare data in the new edition of the Code, published last April, have been recognised all over the world as a major contribution to lighting technique. Simultaneous with the Code, work has also been carried out on other subjects and two I.E.S. Technical Reports, one dealing with lighting in hazardous situations and the other with a new British method for calculating coefficients of utilisation, have been published.

During the last 50 years the Society has been concerned with the attainment of higher standards of illumination, but the achievements of the lighting industry and the wider recognition of the benefits of good lighting have now reached the situation in which higher values could be obtained and economically justified. Quality of lighting and the avoidance of glare are now the main pre-occupation of the lighting engineer and the work which has been incorporated in the new Code must now be consolidated by further studies. The present trend of increasing illumination levels is bound to continue and as levels increase so will problems of quality control in lighting become more acute.

The integration of the lighting equipment with other essential services and features of modern building design also involves many practical problems. The lighting engineer and designer must keep abreast of developments in all services, including heating, ventilation and acoustics.

Electricity Supply Economics

Discussions at Twelfth U.N.I.P.E.D.E. Congress

Some 800 delegates from electricity supply authorities in 27 countries attended the 12th Congress of the International Union of Producers and Distributors of Electrical Energy at Baden-Baden and afterwards took part in the study tours of manufacturing plants and electricity supply installations in West Germany. A member of our staff who was present reviews and comments on some of the trends revealed in the working sessions held from 11th to 14th October

WITH the growth in the number of national and international conferences in the electrical field even those that are well established need to be looked at more critically. Do they warrant the time and expense involved in the attendance of many senior people from a single industry? The opportunities which these gatherings provide for personal contacts between those with similar professional interests in different countries, valuable though these can be, are not alone a sufficient justification.

On the evidence of its 12th triennial congress, held at Baden-Baden, West Germany, last week, the International Union of Producers and Distributors of Electrical Energy clearly continues to perform a valuable, and in some respects, unique role. Since it was founded in 1925, U.N.I.P.E.D.E. has endeavoured to avoid duplicating the work of the World Power Conference and International Conference on Large Electrical Systems (C.I.G.R.E.) by refraining from the direct study of, for instance, "fossil" energy resources and the strictly technical aspects of electrical energy transmission. The practical questions involved in the actual exchanges of electrical energy between member countries are left to the Union for the Co-ordination of the Production and Transport of Electric Power (U.C.P.T.E.), and there is close co-operation with many other international electrical organisations.

This is far from meaning that U.N.I.P.E.D.E. is not concerned with the availability of fuel supplies, the development of international interconnection, and the technical advance of generation, transmission and distribution plant. But it considers the problems involved from the point of view of people whose daily task is concerned with the efficient and profitable operation of a public utility which has (to quote Mr. P. Ailleret, Electricité de France) two aims: to supply electrical energy to consumers at the lowest price, and provide this supply with the utmost possible reliability. To these two aims Mr. F. H. S. Brown (C.E.G.B.) has added a third: to obtain a commercial return on the capital employed, a factor that applies particularly when comparing alternative ways of meeting a given requirement of supply. It was such considerations that formed the essential background to the discussions at Baden-Baden last week, which ranged from a general appraisal of the role of nuclear energy to highly detailed analyses of tariff theory and the more

scientific application of statistical techniques to load forecasting.

At the U.N.I.P.E.D.E. Congress the authors do not present their papers. These are circulated in advance and then grouped for discussion under the direction of the chairman of the appropriate study committee. There are at present nine of these committees covering nuclear energy, international interconnections, hydro-electric generation, thermal generation, tariffs, applications of electrical energy, statistics, load-curve analysis, and distribution. Last week 44 papers, many containing supplementary reports, were discussed in seven sessions lasting up to 4½ hours. Among the most interesting papers were those that provided an account, albeit often only an interim one, of the investigations undertaken by the study committees. It is, in fact, this continuing work, and not the congress itself, which forms the main and most productive activity of U.N.I.P.E.D.E., and the papers themselves provide an encyclopædia of knowledge on all aspects of the electricity supply industry, most of which could not be acquired in any other way.

British Contributions

Apart from the sheer volume of the written and oral contributions, any assessment of the significance of the latest congress is complicated by the extent to which contribution to the discussions is governed by considerations of national prestige. This means that a disproportionate amount of time is often given up to hearing accounts of progress in the smaller countries. But since the importance of maintaining national prestige cannot, unfortunately, yet be discounted in international gatherings, it was disappointing that there were not more British papers and that the numerous Electricity Board representatives did not intervene more frequently in the discussions. But such British contributions as there were were admirably succinct and effective. A large gap has been left by the death of Mr. R. Y. Sanders (Electricity Council) and it is important that this should be filled by someone who will be equally hard working and effective in the international sphere.

Before leaving this point of national competition, it is salutary to note the extent to which the congress provided confirmation of the fact that technical achievement is less

an indication of superior qualities in any one country, than that circumstances have led to a situation that has stimulated a particular line of development. Real progress is often more subtle and difficult to identify. On the commercial side, the British electricity supply industry, through integration in many cases, has reached a stage well beyond that implied in some of the papers, but at the same time it would seem that on the Continent generally supply authorities are bringing a much more highly concentrated intellectual effort to bear on such questions as tariffs and the application of modern statistical methods and market research to the determination of the pattern of load growth.

Growing Demand

The leading problems of the electricity supply industry arise out of the steady upward trend in the demand for power. The classical curve indicating a doubling of consumption about every ten years does not yet show any signs of levelling off, even in the most highly-developed countries. Thus, although nuclear power is now regarded more sceptically than a few years ago, it is realised that there would be considerable anxiety about future energy supplies if this new source had not come forward as a possible solution. But, as Mr. P. Ailleret pointed out, in a broad survey of the main problems that the utilisation of nuclear power sets for electricity supply undertakings, there was as yet no real experience of nuclear power station operation and practical data on real cost prices would not be available for three or four years. The life of the stations was also unknown and though there was optimism on this point, and on the probable operational reliability, those responsible for the decisions involving important capital investments were conscious of the hazards.

Mr. Ailleret was himself optimistic about the likely availability of nuclear fuel, but pointed out that if the development of nuclear power in the Common Market countries was not to be restrained it was indispensable for the fuel (including enriched fuel) "to be available at any moment at a well-defined price which may evolve in the same way as the prices for coal and oil evolve."

Size of Reactor

Several European countries have already sought the assistance of the United States in installing small nuclear reactors to gain initial experience and delegates from others made it clear that they would follow suit if they could obtain financial assistance from some international organisation. Mr. Ailleret's arguments in favour of installing initially a higher-powered reactor were thus of particular significance. Mr. F. H. S. Brown (C.E.G.B.) was able (in a written contribution) to reinforce them by pointing out that in British experience, in addition to the simple economies achieved by size, there was an important downward reduction in cost with time, arising from the refinement of design and accumulated experience. Also in the British system the early nuclear stations would not experience a falling load factor, as might occur in some hydro countries. Nuclear capacity would have in fact to rise to 30 per cent of the total before this occurred. Mr. Brown agreed that the aim of the first nuclear stations was to gain experience for the future, but he said the fact remained that the necessity to show something more than

the payment of bare capital charges was in itself a concealed handicap to the rapid development of nuclear power.

In the session on international interconnection a clear division of opinion was revealed between those who see scope for increasing the amount of power transmitted across frontiers and even look to the installation of long-distance d.c. links and those who believe that there is no need to develop interconnections since these do not lead to a saving of power and may therefore involve a wasteful investment. There was also a suggestion that existing transmissions might fall into disuse as power was totally absorbed by the growth in the load close to the generating stations. This tendency would, of course, be strengthened by the growing importance of thermal generation compared with hydro generation.

Mr. L. Csuros (C.E.G.B.) announced that the cross-Channel cable would begin commercial operation in December and with Mr. A. Dejou (Electricité de France) he gave some interesting details of the different commissioning experiences at the French and English terminals.

This section also included a review of European practice in the conversion and up-rating of transmission lines by Messrs. P. W. Cash and D. R. Stevens (C.E.G.B.), a very detailed study of the production and distribution of reactive energy in European countries, and an economic comparison of transmission at 225 and 380 kV. The authors of the last paper, Messrs. F. Cahen and P. Gausson (Electricité de France) showed that, taking into account the transformer stations at both ends, which seriously increases the costs of 380 kV transmission, the advantage was in favour of 225 kV below 200 km whereas for the longer distances 380 kV was more economical.

Utilisation of Hydro Resources

The progressive exhaustion of available water resources in Europe means a greater effort on the part of hydro-electric engineers in the exploitation of resources still to be harnessed and in the building of plants that some time ago would have been considered uneconomic. It has also led, as the discussions in the session on hydro-electric generation showed, to closer study of the methods of operation and regulation of the overall water reserve of interconnected systems, in order to meet the energy demands in the best possible way, irrespective of hydrological conditions, and to consideration of the problem of distributing the reserve from different reservoirs.

Though the ratio between hydro and thermal generation in Europe has not so far changed appreciably it seems impossible, according to the study by Mr. C. M. Marcello (Edison Milan) and Mr. G. Bardon (Electricité de France), that with the continuing increase in demand the contribution of hydro-electric energy will long remain at the level of about one-third of the total production. In certain countries it is already necessary to consider very carefully the problem of co-ordination between the existing hydro-electric resources and other sources of energy. However, Mr. A. A. Fulton (North of Scotland Hydro-Electric Board) pointed out that pumped storage must now be added to the straight choice between hydro and thermal generation. Nevertheless, much importance is attached to the part that hydro-electric resources, both existing and to be exploited, will play in the general economy of electricity supply. In particular, Messrs. Marcello and Bardon

pointed to the likely development of run-of-the-river resources that had so far been neglected and to the construction of peak load plants. In general, it was agreed that this was a field that offered increasing scope for co-operation between engineers and economists.

Operation of Large Thermal Units

In the field of thermal generation the rapid rate of technical progress leading to ever-larger generating units is making it possible to meet the constant increase in demand under continuously improving economic conditions. An exhaustive comparison of European experience with 79 reheat units of 100 MW and over was provided in a paper by Mr. F. Torresi (Electricité de France). An interesting constructional point here was the use of metal for the bases of 11 of the units studied. The main advantage is said to be in the reduction in the concrete sections which have to be large to eliminate vibrations which are difficult to calculate for this material. The use of metal has made it possible in a station at Strasbourg to place the condenser lengthwise and thus reduce the length of the connections from the turbine hood. It has also enabled the feed-water heaters and steam bleedings to be placed closer to the turbine. The construction cost of bases in the different materials was found to be about the same.

As the number of these large sets in the system increases, and this particularly applies where there is a mixed thermal-hydro production, questions of availability and

frequent starting and stopping are of major importance. Referring to experience with the 100 MW reheat units at Ferrybridge, Mr. P. Briggs (C.E.G.B.) was able to show an improvement on the starting-up times quoted in the paper. Much interest was also shown in a paper by three C.E.G.B. engineers, Messrs. W. L. Parkinson, R. F. Campbell and R. Mills, which described the remarkable achievements in reducing "outage" times for routine overhauls and maintenance through better organisation and more effective use of the manpower available. The potential savings to be made in connection with the larger and more efficient units, of 200 MW and over, and in respect of nuclear stations make it clear that it would be profitable to overhaul such plant in the shortest possible time even though this may involve a substantial increase in the cost of the work. This paper is a useful reminder that the human factors which affect the efficiency of operation and maintenance of power station plant must not be overlooked when considering the rapid technical advances. The work described is, however, still experimental and its application on a routine basis will necessitate further examination of some of the social and human problems involved.

It was announced at the end of the final session at Baden-Baden that the directing committee of U.N.I.P.E.D.E. had accepted an invitation to hold the 13th congress in Stockholm at the end of June, 1964.

(To be continued.)

CLEAN AIR CONFERENCE

THE annual conference of the National Society for Clean Air, which was held in Brighton from 4th to 6th October, was opened by Mr. John George (Parliamentary Secretary, Ministry of Power) and attended by nearly 1,000 delegates. In his presidential address Lord Cohen of Birkenhead (Professor of Medicine, Liverpool University) paid particular attention to the growth of respiratory disease, for which the death rate in Britain was many times that in Scandinavian countries and was responsible for 10 per cent of absenteeism in industry. Dr. S. A. Craxford (Warren Springs Laboratory, Department of Scientific and Industrial Research), describing the national survey of atmospheric pollution in 120 towns, stated that daily measurements with recently-developed instruments were being taken of SO₂ and smoke suspended in the air and not by deposit gauges as formerly.

A criticism of the Society's proposals for a Bill relating to the certification of boiler operatives was received from the Federation of British Industries, which felt that the draft fell between the two stools of clean air and fuel efficiency and that the objects could be better achieved by amending existing Acts. The T.U.C. favoured encouragement of voluntary certification of stokers rather than compulsory methods. Mr. C. M. Opie (National Industrial Fuel Efficiency Service) pointed out that almost every improvement in fuel efficiency was a contribution to clean air and furnished particulars of the N.I.F.E.S. training scheme, emphasising that boiler operation should be recognised as a skilled craft and remunerated accordingly, as it was by the electricity supply authorities and some large industrial concerns. Mr. G. F. Webber (Combustion Engineering Association) discussed the engineering features to secure appropriate boiler designs.

In a survey of the progress made in some major industries, especially pottery and iron and steel, towards avoiding atmospheric pollution, Mr. J. W. Dickie (F.B.I.) gave comparative yearly statistics of different types of fuel used, which indicated the considerable increases being made in the use of electricity. On the domestic side, Mr. W. F. B. Shaw (Warren Springs, D.S.I.R.) dealt with whole-house heating and mentioned the merits of off-peak tariffs in encouraging the use of electrically-warmed floors.

A statement on diesel engine exhaust smoke which had been sent to the Ministry of Transport, was submitted by Mr. Arnold Marsh (secretary of the Society). This attributed the nuisance mainly to incomplete combustion of fuel (owing to inadequate maintenance) and overloaded engines, and referred to the practice of London Transport of under-rating its bus engines by 10 per cent.

Items of electrical interest at the exhibition were displayed by the following concerns:—Associated Electrical Industries, Ltd., dust measuring equipment; Berry's Electric, Ltd., "Magicoal" fires; Electrical Development Association, underfloor heating; British Railways, photographs of large-scale electrification in the Southern Region; Central Electricity Generating Board, equipment in use to avoid air pollution; Foster Instrument Co., Ltd., smoke density measurement; E. Green & Son, Ltd., flue dust collection and classification; L. G. Hawkins & Co., Ltd., coal-effect and "Florida" fires; W. C. Holmes & Co., Ltd., dust precipitators; Lodge-Cottrell, Ltd., precipitators; Morphy-Richards, Ltd., domestic heating appliances; Musgrave & Co., Ltd., precipitators; South Eastern Electricity Board, off-peak block storage and floor warming systems and other domestic appliances; and Thermalay, Ltd., carpet heaters.

Trends in Computer Engineering

By W. S. ELLIOTT, M.A., M.I.E.E., F.Inst.P.

Summary by the author of his inaugural address as chairman of the Measurement and Control Section of the Institution of Electrical Engineers which was delivered at a meeting in London on 10th October

AT the beginning of the 1950's Cambridge and Manchester Universities had built and were operating the world's first stored programme digital computers. Since these machines were built there have been many developments in the closely-connected subjects of machine organisation and computer technology.

In machine organisation, the concept of "micro-programme control," due to Dr. M. V. Wilkes, director of the Mathematical Laboratory of Cambridge University, has rationalised the design of the previously complex and untidy control circuits in a computer. With micro-programme control it is possible in principle to change the whole order code of a computer by replacing a "fixed store" in which the micro-programme is written. Another new feature of machine organisation is the ability to have several programmes stored in a machine at once and leave the computer to decide which to work on, so saving a great deal of computer time. The user, who is concerned with one programme, is unaware of the existence of the other programmes.

In computer technology, the cathode-ray-tube memory of the Manchester machine and the mercury delay time store of the Cambridge EDSAC have been superseded. Most computers use ferrite core main memory blocks backed up by magnetic drums, tapes or discs. The emergence of the ferrite core memory in the second half of the 1950's is one of the most striking developments of the decade, which has given the present computers their speed and capacity.

Standard Plug-in Units

During the past ten years, transistors have replaced valves as active circuit elements and have given computers greater reliability and smaller size and power requirement. Another notable trend has been to have sets of standard circuits "packaged" on plug-in units of standard physical size. The Ferranti "Pegasus" appeared in 1956 with only 21 types of plug-in unit and the computer proved very reliable in service. Almost all present-day computers are designed round a set of printed circuit cards plugged into a back panel carrying the inter-package wiring. The cards carry various types of transistor circuitry.

What of the future? The trend is always to satisfy the market, and the market demands higher speed and greater reliability. The "cycle time" of the ferrite core store is now one or two microseconds. This is the figure

for "blocks" of 4,096 words and it does not seem possible to improve it, though a time of 0.5 μ sec can be achieved with blocks of only a few hundred words. Thus, computer speeds are limited by the store. A possible increase in store speed is offered by the thin magnetic film store. In a very thin film the direction of magnetisation can be switched round much more quickly than in the "bulk" material of the now familiar toroidal ferrite. The time constant of the process is thought to be one or two millimicroseconds. This cannot be achieved in a complete memory array, but cycle times of 300 μ sec might soon be possible in thin film memory arrays of 1,024 elements.

Transistor circuits are already being used with delay times of 30 μ sec and these, with other features, give ATLAS its phenomenal speed of a million operations per second. Transistor speeds may be increased somewhat so that in conjunction with the thin film memory we can begin to see even faster machines coming, but speed is limited by circuit capacity and, ultimately, by pulse velocity along the wiring, and there is not a long way to go with our present methods of construction.

Application of Cryotron Techniques

A big leap forward in speed may come with the cryotron. This is really a minute relay which has to be operated at the temperature of liquid helium three or four degrees above absolute zero. A computer as large and complex as ATLAS could, in principle, be made in a 1ft cube by cryotron techniques, but these techniques have only so far reached the point of testing out simple loops with small numbers of cryotron relays. These have been shown to work at 10 μ sec. They are made by evaporating thin films in a vacuum on to a glass substrate and it is quite foreseeable that complete circuits could be made by an automatic process.

Computers are already being used to help in the design of new computers and the cryotron computer could be designed by a present-day computer. When we say that the computer helps to design another one, we mean that it takes an enormous load of clerical work off the engineers' shoulders and makes sure that all the documents and drawings are up to date. A cryotron computer could be made today with the operating speed of conventional present-day computers. The realisation of the vastly increased speed potential of the cryotron computer is a few years away.

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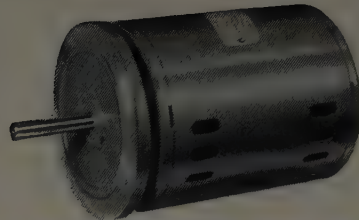
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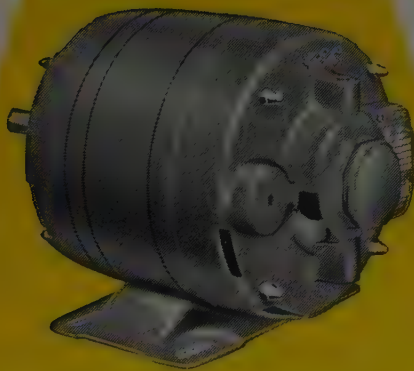
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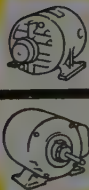
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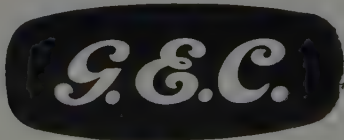
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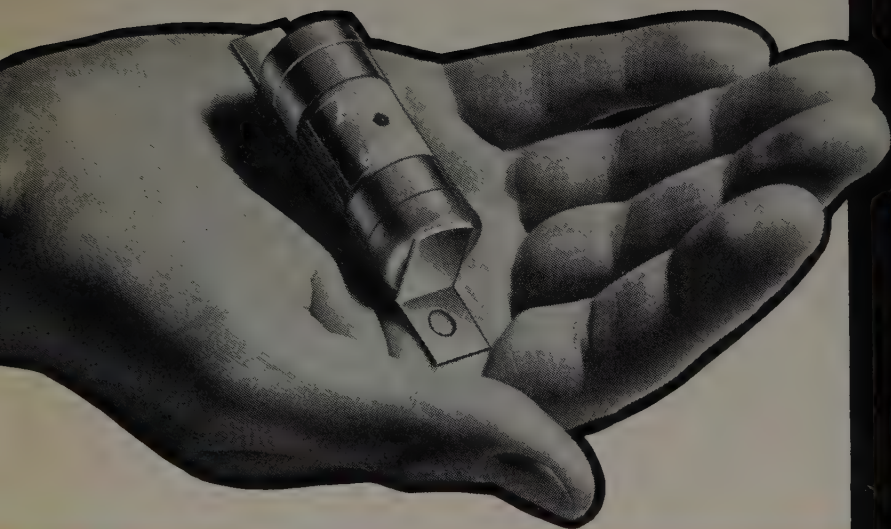
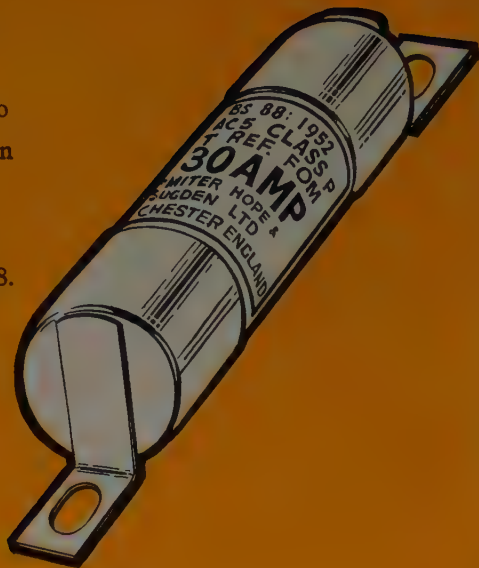


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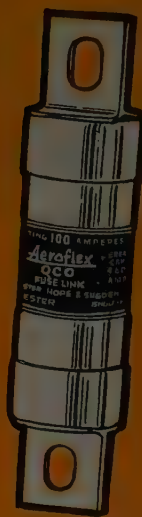
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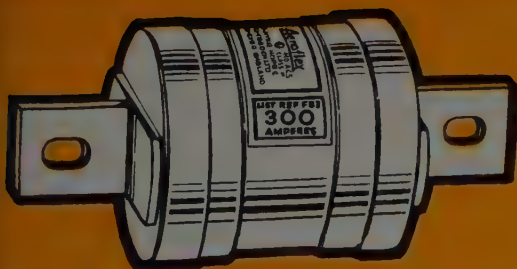


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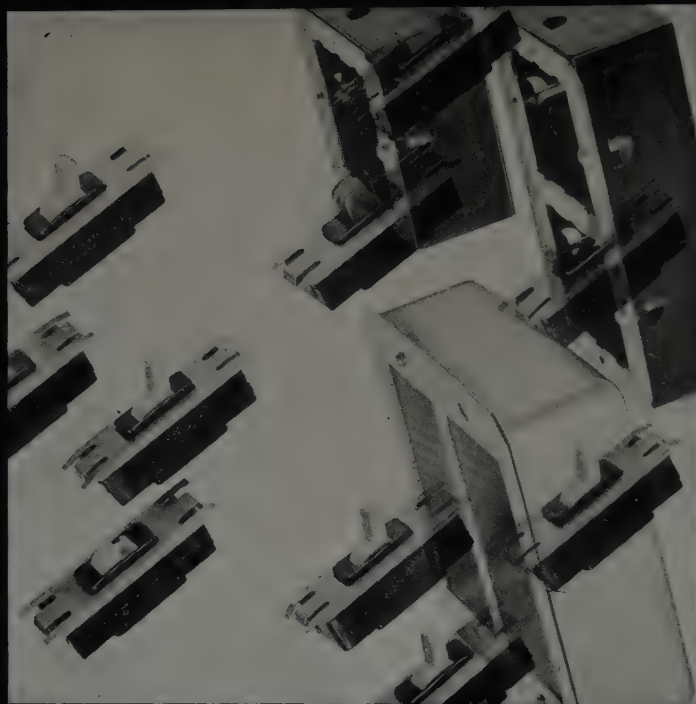
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G.E.C. Installation Equipment Group have a *new approach* to designing switches. Now you can fit any of the 11 interchangeable 'Mutac Clipper' switch units into just 3 different sizes of grids and boxes . . . for example, 3 switch units into a standard BS 1299 or plaster depth box. G.E.C.'s new approach makes 'Mutac Clipper' switches unrivalled for ease and speed of assembly . . . ensures that these precision-made, electronically-tested switches give a *guaranteed* long-life performance . . . takes the clicking out of switching.

Interchangeable switch units:

- 5 amp 1 way S.P.
- 15 amp 1 way S.P.
- 5 amp 1 way D.P.
- 5 amp 2 way S.P.
- 5 amp 2 way & off
- 5 amp intermediate
- 5 amp 1 way secret
- 5 amp 2 way secret
- Bell Push
- Neon Indicator
- Blanking Unit

'Mutac Clipper' switches cost no more than ordinary switches to buy and far less to install—that's a result of G.E.C.'s *new approach*.

Complete interchangeability of 'Mutac Clipper' enables you to standardise right through a job.

IMMEDIATE DELIVERY
of all 'Mutac Clipper' switches from wholesalers throughout the country. If you would like more detailed information ask your wholesaler for 'Mutac Clipper' literature.

VIEWS on the NEWS

By "REFLECTOR"

IS a television studio a factory? In 1958 the Granada T.V. Network, Ltd., sought to have the Chelsea Palace Theatre, which they had converted into a television studio, derated as an "industrial hereditament." This claim was rejected by the local Valuation Court and the company appealed to the Lands Tribunal which upheld the Valuation Court's decision. According to a report in *The Times*, the appellants argued that because the mechanical process of transmission took place in the studio it was a factory. The president of the Tribunal said that it was claimed that what was created and transmitted was an electrical impulse (I should have thought a series of impulses). Although in particular circumstances electrical energy could be regarded as an article, the president was "unable to persuade himself" that this electrical impulse was an article within the meaning of Section 149 (1) of the Factory and Workshop Act, 1901. I don't know why, but this case calls to my mind the form of charge used in cases of misuse of public telephones—"the fraudulent abstraction of electricity." I have never understood how telephonic impulses could be "abstracted."

* * *

Sir William Holford, the eminent architect who was appointed a part-time member of the Central Electricity Generating Board to keep an eye on the Board's power stations and transmission lines from the æsthetic point of view, has written an article for the *Architect and Building News* in which he deals with the principles governing the design and siting of the stations and lines. He makes it clear that a great deal of time and thought is devoted to making these works fit into their surroundings as closely as possible so that on occasions they may even improve them. Sir William says that a power station "may brighten and enhance a dull industrial area or even stand with quiet majesty in a rural or marine landscape." He goes so far as to confirm something that I have suspected for some time:—

"The whole future of electricity generation and transmission is beginning to depend increasingly on overcoming problems of amenity and not those of productivity or supply."

* * *

Some idea of the extent of the power station ash disposal problem can be gauged from a statement in an article in "Dragonpower" (the magazine of the South Wales Division of the C.E.G.B.). It relates to the output of anthracite duff ash from the Tir John (Swansea) station. By 1955 two ponds, three acres in extent, had been filled

to a height of 40ft. The deposits were very fine and liable to be blown about in a high wind. It was found that the covering of the dust with soil and sewage effluent was expensive and it was therefore decided to grass the area. As the ash had been thoroughly sterilised this was likely to prove difficult, and the Botany Department of Birmingham University was asked to help. After some trials the whole area was seeded with rye grass, white clover and creeping red fescue and now the site is healthily overgrown. Improving upon Dean Swift's exemplar, the men from Birmingham have thus made millions of blades of grass grow where there was none before. They did it by soaking the seeds in milk treated with bacteria which continued to adhere to the seeds when they were dried, so causing germination.

* * *

Letters are appearing in the provincial newspapers asking why, when they have made substantial "profits," the Electricity Boards cannot reduce their charges, or at least refrain from increasing them. This happens every year and it makes me wonder whether the way of announcing the financial results is the best one or whether it would not be wise to give the figure for the surplus less the amount taken from revenue for capital purposes. I know that this would be unorthodox accountancy and might give the Press an opportunity of criticising the Boards for their apparently poor showing, but at least it would prevent consumers from thinking that they were being grossly overcharged.

* * *

A note reporting what might be described as electricity in horse traction appeared in the *Electrical Review* of 16th October, 1891. It went as follows:—

"A very successful and satisfactory public exhibition and test of the Holson electrical apparatus for stopping runaway horses was recently given in Chicago. The apparatus, which is very simple, appears to be nothing more than an ordinary set of harness with a small dry battery, the case of the latter being about 6in by 6in by 3in, under the driver's seat. From this, through the lines or along the pole or shaft of the vehicle, extend wires to small metal electrodes placed within the nostrils of the horse—not in the tender portion of the nose, but in a tough, wet fold of skin and hair within the nose, so that no irritation is caused. Connection is also made with a pushbutton at the driver's seat, and one inside the carriage. The inventor claims that the apparatus will not cause the slightest injury to the horse."

This, it will be noted, was for *stopping*, not starting, runaway horses.

I.E.E. Sub-Centre Chairmen

THE chairman of the North Staffordshire Sub-Centre of the Institution of Electrical Engineers for 1961-62 is **Mr. T. E. Calverley**, B.Sc., Ph.D., M.I.E.E., chief development engineer of the English Electric Co., Ltd. Dr. Calverley received his technical education at King's College, London, and after a period in the Rectifier Department of the English Electric Co. he worked on engineering problems connected with machines for accelerating nuclear particles at the Cavendish Laboratory, Cambridge. In 1949 he was appointed chief engineer of the English Electric Rectifier Department, taking up his present position in 1959.

Mr. J. A. Tatchell, B.Sc.(Eng.), M.I.E.E. (Tees-Side Sub-Centre), was born at Gravesend and received his technical education at the City and Guilds College, London. From 1940 to 1946 he was at the Admiralty Mine Design Department, working on magnetic and acoustic mines, and on mine location, and in the following year served as a graduate apprentice with Bruce Peebles & Co., Ltd. He joined the Birmingham Division of Imperial Chemical Industries, Ltd., in 1948 and since 1951 has been senior design engineer in charge of all electrical design work in the Division. Mr. Tatchell is vice-chairman of Billingham Urban District Council.

Mr. W. E. Lewis, B.Sc., Ph.D., A.M.I.E.E. (West Wales (Swansea) Sub-Centre), is Head of the Department of Electrical Engineering at Swansea College of Technology. He

graduated B.Sc. at Birmingham University in 1945 and obtained his Ph.D. degree in 1949 following research work on dielectrics.

Mr. D. H. Macnee, B.Sc., M.I.E.E. (South-Western Sub-Centre), has been with the Valve Division of Standard Telephones & Cables, Ltd., since 1938, becoming chief inspector in 1950. He graduated at Glasgow University and between 1926 and 1931 worked in the European Engineering Department of the International Standard Electric Corporation, London, and then in the Interference Department of the International Telephone & Telegraph Laboratories, Hendon. He joined Callender's Construction Co., Lahore, India, in 1931 and was in charge of installing the automatic telephone system used in conjunction with the Uhl River hydro-electric project, Punjab. From 1935 to 1937 he was chief engineer of the Gramophone Company's Radio Designs Department in Sydney, Australia.

Mr. F. Clegg, A.M.I.E.E. (North Lancs. Sub-Centre), was appointed assistant operation engineer, No. 4 Sub-Area, North Western Electricity Board, in 1958, having previously been district engineer at Fleetwood since 1949. He started his career with the Rochdale Corporation Electricity Department where he held various positions between 1926 and 1946. He then took up the post of senior assistant engineer at Hammersmith and in 1948 was appointed mains superintendent with the Fleetwood undertaking. Mr. Clegg was for 13 years a part-time lecturer in electrical engineering at the Rochdale and Blackpool Technical Colleges.

Mr. K. J. R. Wilkinson, D.Sc., M.I.E.E. (Rugby Sub-Centre), graduated in electrical engineering at Bristol University and served his apprenticeship with the British Thomson Houston Co., Ltd., subsequently joining the company's research laboratory. He became interested in a.c. bridge measurements and in surge phenomena and developed a restriking voltage indicator for use in switchgear testing plants. During the last war he developed high power modulator systems for radar and for a thesis based on this work he was awarded the D.Sc. In 1944 he was a member of the British team on atomic energy working in America. Later he designed and, in collaboration with the Clarendon Laboratory in Oxford, developed a 16 MeV betatron, now in the Science Museum. He has been awarded the



Mr. F. Clegg



Dr. K. J. R. Wilkinson



Mr. H. B. Hughes



Mr. G. L. Doig

I.E.E. Student, Measurement Section, Duddell and Silvanus Thompson premiums.

Mr. H. B. Hughes, B.Sc.(Eng.), M.I.E.E. (South West Scotland Sub-Centre), was born in Belfast and obtained an honours degree at London University. He began his career with the Belfast branch of the Sunderland Forge & Engineering Co., Ltd., and later carried out sub-contracts on the Clyde, Mersey and Tyne. In 1933 he was transferred to the London office and in 1936 was appointed assistant manager for Scotland. Since 1946 he has been electrical manager with Alex. Stephen & Sons, engineers and ship-builders, Glasgow.

Mr. G. L. Doig, B.Sc.(Eng.), A.M.I.E.E. (North Scotland Sub-Centre), was educated at Grove Academy and St. Andrews University and received his training with the Metropolitan-Vickers Electrical Co., Ltd. Since 1948 he has been with the North of Scotland Hydro-Electric Board and at present holds the position of operation and maintenance engineer, Dundee Area.

British Display in Peru

More than 70 British firms are exhibiting or are represented by agents in the display in the British Pavilion and its central courtyard at the Second Pacific International Trade Fair in Lima, Peru (12th to 29th October). They are showing products ranging from marine diesel engines to washing machines and refrigerators. The Pavilion, provided by the Board of Trade, covers an area of 2,200 sq yd.



Dr. T. E. Calverley



Mr. J. A. Tatchell



Dr. W. E. Lewis



Mr. D. H. Macnee

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The board of Submarine Cables, Ltd., has been re-constituted by the appointment of three new executive directors responsible to the existing managing director, **Mr. F. W. H. Shaw**. They are **Mr. C. L. G. Fairfield** (commercial director), **Mr. G. H. Foot** (chief engineer) and **Mr. S. J. Wilson** (works director). The company is owned jointly by Associated Electrical Industries, Ltd., and British Insulated Cables, Ltd. Sir John Dean is chairman, the A.E.I. representatives on the board are Dr. J. N. Aldington and Mr. L. S. Crutch, and those of B.I.C.C. are Mr. R. M. Fairfield and Mr. D. T. Hollingsworth. Dr. J. N. Aldington and Mr. R. M. Fairfield are deputy chairmen. The Engineering Division of the Telegraph Construction & Maintenance Co., Ltd., has been absorbed into the company.

Mr. J. P. Tucker, D.L.C., M.I.E.E., manager of the Lincolnshire Sub-Area of the East Midlands Electricity Board, is retiring on 30th November. He will be succeeded by **Mr. W. W. Grimes**, M.I.E.E., A.M.I.Mech.E., the present deputy sub-area manager, whose place will be taken by **Mr. D. E. Castley**, Associate I.E.E., at present manager of the Stamford District.

After completing his education at Loughborough College, Mr. Tucker joined the Yorkshire Electric Power Company in 1923 as a district engineer (operation). He later became district engineer and sales engineer before taking up an appointment as engineer and secretary to the Isle of Man Electricity Board. In 1936 he was appointed engineer and manager of the Loughborough undertaking and at vesting date he became manager of the Lincoln District of the E.M.E.B., assuming his present position shortly afterwards.

Mr. Grimes joined the West Ham Electricity Department in 1928 and remained with the undertaking for 13

years. In 1941 he was appointed as a senior technical assistant at Chesterfield and two years later he was promoted to engineer and manager of the undertaking, a position he retained until vesting date when he became manager of the Chesterfield District of the Board. He took up a similar post in the Lincoln District in 1958, becoming deputy sub-area manager last April.

Mr. Castley was with the Norwich Electricity Department for 11 years and then spent a similar period with the Mid-Lincolnshire Electric Supply Co., Ltd. He has held his present position since vesting date.

Mr. Richard Piper has been appointed district commercial manager, Bristol South, by the South Western Electricity Board; he succeeds **Mr. C. J. R. Blackett** who was recently appointed manager of the Board's Exeter District. Before joining the South Western Board as an agricultural show



Mr. R. Piper

assistant in 1950 Mr. Piper was with the North Western Board. In 1951 he was promoted to be senior assistant engineer (commercial), Devon Group, based at Exeter.

Mr. J. C. Brooman, F.C.A., and **Mr. E. A. King**, A.C.A., have been appointed to the board of Black & Decker, Ltd., as export sales director and financial director, respectively. **Mr. J. H. Longland** becomes sales manager in the United Kingdom and **Mr. R. K. Symmons** marketing manager.

Rich & Pattison (B'ham), Ltd., electrical wholesalers, held their annual dinner and theatre party on 5th October, 200 members of the staff, their wives and friends of the company being present. In his welcoming remarks to the guests, Mr. W. L. Rich briefly reviewed the com-

pany's progress during the past twelve months. He said that the company had now settled down in its new headquarters at Essex House, Birmingham, and that the more spacious and pleasant surroundings were leading to increased efficiency and ease of distribution of their products.

Mr. David A. Bell, B.A. (Oxon), Ph.D., has been appointed director of the new Research Laboratory of A.M.F., Ltd., at Peppard. Dr. Bell, who was for 12 years on the staff of the Electrical Engineering Department of Birmingham University, is an authority on automation, computers and information theory. He was awarded a Ph.D. for work on fluctuations of electric current in conductors and semiconductors. He has written several books, articles and papers on subjects ranging from specialised aspects of electricity and electronics to general views on automation and research management. Dr. Bell is a fellow of the Physical Society, and chairman of the Birmingham Branch of the British Computer Society.



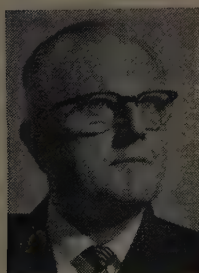
Dr. D. A. Bell

Mr. Francis Seely, B.Sc., has joined the Semiconductor Division of Mullard, Ltd., as sales manager.

Philips Electrical, Ltd., announce that **Mr. B. N. Lewis**, previously an assistant to the group commercial manager, has been appointed a commercial manager in the Major Domestic Appliances Group.

Mr. D. H. Maxwell, sales manager of the Transmission Division of the Telephone Manufacturing Co., Ltd., left on 8th October for a six-week tour of the Middle and Far East.

The South Eastern Electricity Board has appointed **Mr. R. E. Gleadow**, A.M.I.E.E., as commercial officer, Mid-Sussex Sub-Area, to succeed **Mr. F. Lynn**, A.M.I.E.E., who retires next January. With this appointment Mr. Gleadow rejoins Seaboard after six years with the North Western Electricity Board where he was district consumers' engineer, Bolton District, and senior assistant commercial engi-



Mr. J. P. Tucker



Mr. W. W. Grimes



Mr. D. E. Castley

neer in No. 6 Sub-Area. From 1951 to 1955 he was district commercial engineer in Seeboard's Tunbridge Wells District.

The North Eastern Electricity Board has appointed **Mr. G. R. Walker**,



Mr. G. R. Walker

A.M.I.E.E., as assistant chief engineer (distribution system planning) in succession to **Mr. G. S. Lisle**, M.I.E.E., who is retiring.

Mr. Walker is at present senior assistant engineer (distribution design) in the No. 2

(Huddersfield) Sub-Area of the Yorkshire Electricity Board. He began his career as a student apprentice with Croydon Corporation in 1937 and served as an officer in the Royal Norfolk Regiment during the war, later holding appointments with the South Eastern Board at Croydon, the Eastern Board at Romford and the Yorkshire Board at Goole before taking up his present position in 1956.

In accordance with custom, the Scottish Section of the **Electrical Wholesalers' Federation** invited the Council to hold one of its meetings during the year in Scotland. This annual gathering took place at the Marine Hotel, North Berwick, from 3rd to 6th October and was attended by guests from several other electrical associations. A golf competition attracted a strong entry, the winner of the cup being **Mr. T. T. Young** who also received the president's prize. The second prize was won by **Mr. J. Kerr**. **Mrs. W. E. Hind** was the winner of the ladies' competition, **Mrs. J. Kerr** being the runner-up. At the dinner on 5th October **Mr. G. E. McIver**, chairman of the Scottish Section, proposed the health of "The Guests," to which **Mr. R. W. S. Mackay** responded.

Mr. John H. Hirst, president of the Federation, also replied to the toast on behalf of the Council. The toast of "The Ladies" was given by **Mr. W. J. Bird** and the response was made by **Mr. G. Conradi**.

Mr. H. E. Levy, B.Sc., A.M.I.E.E., chief engineer, has been appointed to the board of Foster Transformers, Ltd., a company in the Metal Industries Group. Born in Cologne, **Mr. Levy** was educated there and later at Northampton Engineering College, London University, where he gained an honours degree in engineering. **Mr. Levy** joined Foster Transformers in 1955 and was appointed chief engineer two years later.

Matthews & Yates, Ltd., manufacturers of fans and air treatment plant, have appointed **Mr. L. Barton**, **Mr. A. B. Crompton**, **Mr. G. L. Jaques**, A.M.I.Mech.E., and **Mr. L. Winstanley**, A.M.I.Mech.E., as assistant directors.

Mr. A. E. Somers, at present senior assistant engineer (commercial), Essex



Mr. A. E. Somers

Sub-Area, Eastern Electricity Board, has been appointed to succeed **Mr. C. A. Baker** as manager of the Edmonton District in the Northmet Sub-Area of Eastern Electricity. **Mr. Baker** retires in December. **Mr. Somers** received

his technical education at the Borough and Northampton Polytechnics in London and served an electrical engineering apprenticeship with the Ilford Electricity Department. Later he was with the County of London Electric Supply Co., Ltd. After nationalisation he became the district engineer at Brentwood. For five years he was second assistant engineer

(planning), Essex Sub-Area, and was later appointed second assistant engineer (commercial).

Mr. R. Chaffey has been appointed deputy commercial manager of Mar-



Mr. R. Chaffey

coni Instruments, Ltd. **Mr. Chaffey**, who joined the company in 1940, was seconded to the Canadian Marconi Co. in 1954 as head of that company's instrumentation sales department. He returned to this country in 1958 to take up

the duties of export manager.

Mr. W. S. Perkins, A.C.G.I., A.M.I.E.E., has been appointed divisional executive (Rugby) of the A.E.I. Transformer Division. **Mr. Perkins** was educated at Uppingham School and the City and Guilds Engineering College, London, and served a student apprenticeship with the B.T.H. Co. at Rugby. After working in the Transformer Engineering Department and the transformer section of the Contract Department, he joined the newly formed Transformer Sales Department in 1932 and in 1960 was appointed manager.

Mr. J. W. Sheldon, who has been secretary of Gent & Co., Ltd., since 1957, has resigned owing to ill-health. **Mr. Sheldon** joined the company in 1919 and became head of the cost office before being appointed chief accountant in 1953.

New members of the Council of Scientific and Industrial Research include **Mr. L. H. Bedford**, C.B.E., director of engineering, Guided Weapons Division, English Electric Aviation, Ltd., and **Mr. G. B. R. Feilden**, F.R.S., managing director, Hawker Siddeley Brush Turbines, Ltd.

Mr. R. J. Fothergill, B.Sc.(Dunelm), A.M.I.E.E., has been appointed general and technical manager of the Artic Fuse & Electrical Manufacturing Co., Ltd., Birtley, Co. Durham.

The London Electricity Board has appointed **Mr. H. F. Rouse**, A.M.I.E.E., as district engineer, South Eastern District.

Mr. J. R. Pugh, M.A., A.M.I.E.E., has been appointed manager of the Packaging Division development department of Albert E. Reed & Co., Ltd. **Mr. Pugh** joined British Insulated Callender's Cables, Ltd., in 1948 as a graduate apprentice and later worked on the technical aspects of railway electrification schemes. He



At the annual gathering arranged by the E.W.F. Scottish Section. Back row (left to right): Messrs. L. B. Burn, H. D. Denman, F. J. Blackwell, P. B. Etheridge (director), T. S. Weston and G. Conradi. Front row (left to right): Messrs. H. Riley, John H. Hirst (president), J. W. E. Rutherford and E. H. Maltby

was subsequently appointed traction engineer to the company and in 1960 he became chief development engineer responsible for the planning, operation and financial control of the Accessories Division development programme.

Mr. James Coward, M.I.E.E., assistant generation engineer at the North of Scotland Hydro-Electric Board's Tummel Valley group of power stations, has been appointed generation engineer in charge of the Board's Conon Valley and Affric group. He succeeds **Mr. J. Stuart Oliver** who has retired.

Mr. Coward, who is forty, started his career in the Burnley Corporation Electricity Department and later became a technical instructor with the Burnley Education Department. During the war he was attached to the Admiralty Signal Establishment, Department of Scientific Research. After service with the North-Western Division of the British Electricity Authority he joined the Hydro-Electric Board in 1951 and in 1955 was transferred to the Tummel Valley generating group.



Mr. A. C. Main, B.Eng., M.I.E.E., M.I.Mech.E., who, as reported in last week's issue, has been appointed director of manufacturing services of Associated Electrical Industries

Mr. W. H. Holmes, managing director of M.T.E. Control Gear, Ltd., Leigh-on-Sea, Essex, is leaving London Airport on 6th November for Adelaide, Australia, where he will start an extensive tour of Commonwealth countries including New Zealand and Canada.

Mr. Sidney Raybould, M.I.E.E., has been appointed manager of the Worcestershire Area of the Midlands Electricity Board in succession to **Mr. R. Mallet, B.A., M.I.E.E.**, who, as previously announced, becomes chief engineer on 1st January next. **Mr. Raybould** has been manager of the Central Gloucestershire Area since 1955. He served a student apprenticeship with the former Shropshire, Worcestershire & Staffordshire Electric Power Co. and from 1935 to 1943 was the company's chief transmission and distribution operation engineer. He then became technical assistant to the general manager, **Mr. D. H. Kendon**, and in 1945 was appointed district manager at Dudley, becoming northern divisional engineer in 1948. Following the formation of the Midlands Electricity Board, **Mr. Raybould** was

In last week's issue we referred to the retirement of Dr. Percy Dunsheath as Chairman of Convocation of London University. The accompanying photograph shows Dr. Dunsheath with the portrait which was presented to him on behalf of the Standing Committee by the Deputy Chairman, Miss M. C. Grobel (right)



appointed deputy manager of the West Bromwich District and he was made district manager in 1949. In 1953 he moved as manager to the Wednesbury District, and in 1955 he became manager of the Central Gloucestershire Area. **Mr. Raybould** is a member of the Western Centre Committee of the Institution of Electrical Engineers.

Mr. A. T. Black, C.B.E., M.I.C.E., M.I.Mech.E., has been appointed managing director of K.G.M. Electronics, Ltd., Richmond, Surrey, to lead a new and progressive programme which K.G.M. is putting into effect. He will, however, still be carrying on his interests as a consultant.

Mr. Douglas Fowler, Associate I.E.E., organisation and methods officer of Brookhirst Igranite, Ltd., has been appointed works manager of Avo, Ltd. Both companies are members of the Metal Industries Group. **Mr. Fowler** was apprenticed with Igranite Electric (now part of Brookhirst Igranite) and had technical sales experience with Brookhirst Igranite in London, Leeds and Manchester, before moving to Bedford in 1957.

Mr. A. J. Leather, M.I.E.E., has been appointed manager of the South Eastern Electricity Board's Central Sussex District, in succession to **Mr. Arthur Barnes**, who recently retired through ill-health. **Mr. Leather**, who is 47, obtained his early training with the Wigan Corporation Electricity Department, later holding



Mr. A. J. Leather

appointments at Shipley, Leeds and Shrewsbury. In 1956 he joined Seeboard as Central Sussex district engineer and for the past three years

he has been with the South Wales Board as district manager, Merthyr and Aberdare.

The United Kingdom Atomic Energy Authority has appointed **Mr. H. V. Disney, C.B.E., M.I.Mech.E.**, as managing director of its Engineering Group in succession to **Mr. J. B. W. Cunningham, M.I.Mech.E.**, who is resigning in January next to take up the position of managing director of Dewrance & Co., Ltd. **Mr. Disney** will take over his new responsibilities progressively and will have the title of managing director (designate) from 1st November.

The following management and staff changes are announced by Holden & Brooke, Ltd.:—**Mr. R. A. Brooke** relinquishes the position of works director on becoming commercial director. **Mr. F. L. Taylor** is appointed to the new post of production controller, his present duties in connection with sales matters being undertaken by **Mr. M. Beesley**. **Mr. S. N. Clift** is retiring from his post as northern area outside sales manager and **Mr. S. K. Hallworth** has been appointed to this position.

OBITUARY

Mr. E. G. Holberry, M.I.Mech.E., M.I.Prod.E., works director of the E.M.B. Co., Ltd., died recently at the age of 51. **Mr. Holberry** served as a captain in the R.E.M.E. in Italy during the war. He joined the E.M.B. Co. as works manager in 1952 after many years with Wilkins & Mitchell, Ltd., and was appointed to the board as works director in 1958.

Mr. E. R. Speed.—The death occurred suddenly on 12th October, at the age of 54, of **Mr. Edward R. Speed**, who was well known in the industry as a manufacturers' agent and represented several firms, including Dorman & Smith, Ltd., and the M.C.B. Co., Ltd.

INDUSTRIAL NEWS

EXPORT TOPICS

Further Points from the B.E.A.M.A. Conference

LAST week, in reporting the Golden Jubilee Export Conference organised by the British Electrical and Allied Manufacturers' Association, we mentioned that the second day was devoted to discussions by five groups of particular aspects of export trade. We now reproduce a summary of these discussions.

"The Changing Pattern of Overseas Trade" was dealt with by a group of which Mr. L. H. Short, M.C., was chairman and Messrs. J. B. Scott, C.B.E., D.F.C., and F. J. E. Tearle were discussion leaders. It was brought out that the pattern of overseas trade for the United Kingdom was being changed by increasing industrialisation throughout the world. The traditional primary producers had begun to manufacture for themselves and sometimes to export, while the industry of the traditional manufacturing countries continued to grow rapidly.

It might thus frequently be advisable to set up a manufacturing subsidiary in an overseas territory. The careful selection and training of younger men from the parent company for assuming positions of responsibility in such a subsidiary overseas was to be recommended as providing valuable experience to the individual and ultimately to his firm. Such appointments should be for a short term only and representatives should be replaced at intervals to ensure that they did not lose touch with developments at home.

The establishment of an overseas manufacturing subsidiary entailed considerable capital outlay, frequently in countries of uncertain political climate, and some system of safeguards should be instituted against governmental expropriation.

Where contracts for major schemes were concerned, the formation of a consortium was very frequently to be recommended. Finance for large projects should be made available at competitive rates of interest. Firms acting as main contractors for major projects should ensure that items in the contract not manufactured by the main contractor were notified to an appropriate U.K. firm. The larger firms in the industry might also help the smaller manufacturer by offering to market his products overseas through their own organisations.

There should be a pooling of market information about the European Common Market, in which the

larger firms, operating through the B.E.A.M.A., could be of assistance.

Where the prompt execution of orders was vital, delays arising through Customs and Excise controls were intolerable and an investigation should be made into the mechanism and facilities available to ensure that goods were cleared as rapidly as possible.

Co-operative Publicity

Mr. H. P. Martin was the chairman and Messrs. M. L. G. Balfour, O.B.E., and C. T. M. Bagnall the leaders in a discussion on "Export Publicity, Advertising and Fairs." It was agreed that there was a real need for more collective publicity by the industry, including co-operation by a number of firms in staging collective displays in overseas exhibitions and fairs, as well as co-operative advertising and prestige literature and films. Advantage could also be gained by a wider sharing of existing export publicity experience, to the benefit of the industry as a whole.

Market Research

The group on "Market Research" (chairman: Mr. W. M. Tribute; leaders: Messrs. N. A. H. Stacey and Aubrey Wilson) discussed the need for a high degree of engineering ability in market research agencies. Some speakers asked if it would not be better to train a firm's engineers for market research; in fact one or two speakers claimed a certain amount of success for this method. But it was pointed out that the techniques of research required a definite way of looking at the problems involved in marketing and that sufficient engineering knowledge could also be acquired by a trained market researcher.

Examples were quoted of successes in export markets following a market research survey, but there were difficulties in market research for purely industrial firms, particularly for those whose output consisted of a vast range of intermediate products.

International Standards

"Standards and Practice and Designs for Foreign Markets" were discussed by another group (chairman: Mr. F. R. Mason; leaders: Messrs. H. A. R. Binney, C.B., and C. A. J. Martin, G.C., M.C.). Mr. Martin emphasised the importance of flexible machinery for keeping national and international standards up to date and of accepting standards founded on the common denomination of modern world practice. Mr. Binney said that with the formation of the Common Market the B.S.I. had taken steps to ensure an opportunity for Britain to join in discussions on the harmonisation of standards and thus avoid technical difficulties later.

Financing Contracts

Mr. E. V. Small was chairman and Messrs. J. McCartney-Filgate, M.C., T.D., and L. J. Menzies were leaders of a group which discussed "Finance for Export." One of the main points which arose was that, since the war, the burden of financing long-term contracts for overseas had shifted from the purchaser to the manufacturer. Normally the banks were able to arrange finance to assist suppliers, but since they operated with depositors' money, they could only lend if the risks involved were secured. They had never yet failed to find funds to finance a medium- or long-term loan if guaranteed by the Export Credits Guarantee Department.

Mr. Menzies gave an assurance that the E.C.G.D. would be ready to meet any demands in respect of contracts undertaken jointly by British and Continental manufacturers.

£330,000 MEXICAN ORDER

In the face of severe international competition an order worth over £330,000 for diesel-alternator sets for the Comision Federal de Electricidad of Mexico has just been received by the Diesel Engine Division of the English Electric Co., Ltd. It is understood that eighteen bids were submitted, including offers from the U.S.A., Europe and this country.

The equipment to be supplied consists of ten completely self-contained mobile generating stations, which are to operate in temperatures varying between 77 and 113°F and at altitudes

between sea level and 7,220ft. They will be used as local sources of power. Delivery of the stations starts in five months. Some of the engines may be arranged to run as dual-fuel units, using natural gas.

Each station consists of a road trailer upon which is mounted a 12-cylinder, exhaust turbo-charged, charge air cooled, vee form diesel engine, designed to develop 1,356 b.h.p. when operating in any conditions between the limits given above. The engine will be directly coupled to a 964 kW alternator.

Aron Meter Business to be Acquired by Ferranti

IT is announced that Ferranti, Ltd., have agreed to purchase the electricity meter business of Aron Meters, Ltd., including manufacturing tools and equipment, for £440,000. Both companies are substantial manufacturers of electricity meters, and were pioneers in this field. Ferranti, half of whose output is exported, have in hand a large programme of modernisation in their Meter Department at Hollinwood which is nearing completion.

At present there will be no change in the conduct of the Aron Meter business, which will continue from Salisbury Road, Kilburn. Eventually, the acquisition will enable production to be concentrated on one basic type of meter for each tariff service, thereby

substantially increasing the scale of production and permitting economic competitive selling prices in all export markets.

Ferranti have agreed to undertake all Aron commitments for spare parts, maintenance and meter repair to ensure that full provision is made for

the normal working life of all Aron meters in service.

To avoid confusion, Aron propose shortly to change the name of their company to Astaron Electronics, Ltd., so that the name of Aron Meters can be used by a newly formed subsidiary of Ferranti. Under its new name, Aron will expedite the move to its new factory at Aylesbury where production will be supplemented by a new range of products not allied to the meter industry.

COMMUNICATIONS SATELLITE PROGRAMME

THE Brush Electrical Engineering Co., Ltd., has received a contract from the G.P.O. to supply control equipment, motors, generators, and servo equipment for a steerable aerial now under construction at the Goonhilly Downs Post Office Radio Station in Cornwall. Another Hawker Siddeley company concerned in the project is Whitworth Gloster Aircraft, whose Electronics Division is building some of the digital electronic equipment.

The 85ft diameter steerable, paraboloid aerial is similar in principle to the one at Jodrell Bank. It will be used in tracking radio communication satellites in a joint G.P.O./American experimental programme scheduled for next year. In these experiments, known as Projects RELAY and TSX, American satellites will be used to transmit speech, telegraphy and television across the Atlantic.

The success of the experiment depends upon accurate steering of the

aerial. The electronic control system must, therefore, work to very fine limits of accuracy and requires the generation of highly accurate positional information by optical shaft encoders. This will be compared with pre-determined steering information provided by a programmed tape, and corrective signals, converted from digital to analogue form, will be supplied to the servo mechanisms. The signals resulting from this process will be fed to the motor control system, which will then cause the aerial to move to the desired position.

Office Lighting Exhibitions

The British Lighting Council has arranged the following conferences and exhibitions on office lighting in view of the coming into force of the Offices Act at the beginning of next year:—

London: Brettenham House, 16-18, Lancaster Place, W.C.2, 23rd, 24th and 27th October.

Yorkshire Region: Y.E.B. Sub-Area Headquarters, Change Alley, Sheffield, 24th to 26th October; British Lighting Council, 24, Aire Street, Leeds, 31st October to 2nd November; and Y.E.B. Sub-Area Headquarters, Ferensway, Hull, 7th to 9th November.

DOMESTIC APPLIANCE SURVEY

Electric cookers will be the subject of our next illustrated survey of domestic electrical equipment (27th October issue). The review will, as usual, consist of a self-contained supplement

CALDER HALL NUCLEAR POWER STATION



The fifth anniversary of the opening of Calder Hall by H.M. the Queen was celebrated last Tuesday. The success of the first five years' operation is commented on in our leading article under the title of "Distinguished Performance"

INDUSTRIAL NEWS *[continued]*

New Ferranti Laboratory

LAST week the new Ferranti electronics laboratory at Silverknowes, Edinburgh, was opened by Sir Vincent Z. de Ferranti, chairman of the company. This 35,000 sq ft laboratory, which has cost £175,000 to build and will employ about 200 people, houses the Applied Electronics Department

under the management of Mr. J. Stewart, M.A., B.Sc., M.I.E.E. The department is employed principally in the development of radar and other systems for the Services for both air-borne and ground use, but a variety of non-military industrial projects are also being undertaken.



New Ferranti electronics laboratory

Allen West Take Over Northern Ireland Factory

The Northern Ireland factory formerly occupied by Lee Guinness, Ltd., at Newtownards, Co. Down, has been acquired by Allen West & Co., Ltd., electric motor control gear manufacturers, of Brighton. The factory, at Comber Road, is a recently built one. It has a total area of 56,000 sq ft, with ample room for expansion and it will immediately go over to the assembly and wiring of standard Allen West contactor panels.

Continuity of employment will be offered to the factory employees and it is anticipated that in three to four years the number of employees will be brought up to approximately 400.

This will to some extent ease the pressure on the works at Brighton, where considerable developments are already taking place to meet heavily increasing demands on the company's manufacturing resources.

It is not intended to transfer permanently any of the Brighton staff to Northern Ireland, where Allen West & Co., Ltd., will continue to be represented by William Reay (Belfast), Ltd.

GAS INDUSTRY IMPROVEMENT

THE recently-published annual report of the Gas Council states that for the year ended 31st March, 1961, the industry had a surplus of over £2 million compared with a deficit of nearly £2.4 million in the previous year. The gross income was £401.9 million. Eight of the Area Boards had surpluses and four deficits. Sales of gas during the year amounted to 2,665 million therms (2.9 per cent increase).

At the end of the period the number of domestic consumers was 12,100,237, fewer by 45,261 than the total at the corresponding time last year. The average consumption per domestic consumer increased by 2.3 therms to 106.7 therms. Sales of domestic appli-

ances during the year were as follows, with figures for the previous period in parentheses:—Gas cookers, 587,703 (795,578); water heaters, 220,580 (232,956); space heaters, 265,358 (244,524); wash boilers and washing machines, 128,319 (182,755); refrigerators, 96,477 (88,350).

Gas sales to industrial consumers showed an increase of 33 million therms or 4.1 per cent. The annual number of therms per industrial consumer rose from 9,120 to 9,650.

New gas-making plant with a total capacity of 43.3 million cu ft/day was brought into use during the year, while plant with a total capacity of 109.3 million cu ft/day was scrapped. Production ceased at 51 stations and at the end of the year 378 works were operating compared with 1,050 at vesting date. There were 124,443 employees of the Gas Council and Area Boards at 31st March this year, compared with 126,970 at the corresponding date in 1960.

E.T.U. APPEAL

The appeal by five defendants, including Mr. Frank Haxell and Mr. Frank Foulkes, from the recent judgment of Mr. Justice Winn granting a declaration that the election of Mr. Haxell as general secretary of the Electrical Trades Union in December, 1959, was obtained by fraud is to be heard as soon as possible after the first day of the next term. This was decided by the Court of Appeal on Monday, when the plaintiffs, Mr. J. T. Byrne and Mr. F. Chapple, asked that the hearing should be expedited.

CHANGES AT TELCON WORKS

THE land cable work of the Telegraph Construction & Maintenance Co., Ltd., having ceased, it has been decided to incorporate its remaining activities at Greenwich, namely, the Engineering Division, with those of Submarine Cables, Ltd. This follows an agreement between the boards of Associated Electrical Industries, Ltd., and British Insulated Callender's Cables, Ltd. Telcon is a member of the B.I.C.C. Group, and A.E.I. and B.I.C.C. have equal interests in Submarine Cables.

All the mechanical and electrical engineering activities of Telcon, with the exception of Telconnectors, will be continued at Greenwich under the Telcon name, including a wide range

of marine and other engineering equipment. The new agreement has already been implemented and will enable improved production facilities to become available at the Greenwich site.

The management and staff of the Engineering Division will remain substantially the same. It is not expected that the transfer of interest to Submarine Cables, Ltd., will create any redundancy at Greenwich other than in land cable production.

The other activities of the Engineering Division of Telcon, covering general factory services and maintenance of all parts of the Greenwich and Erith factories, are also being transferred to Submarine Cables, Ltd.

Contactors



LONG SERVICE LIFE

The SLA range of contactors has a service life of between 10 to 15 million switching operations at up to 6000 operations per hour.

SMALL DIMENSIONS

$2\frac{1}{2} \times 1\frac{1}{2} \times 2\frac{1}{2}$ for a 6 Amp contactor and correspondingly small dimensions for higher ratings.

ACCESSIBILITY

For ease of wiring special consideration has been given in the design of these contactors for easy access to contacts and operating coil.

Backed by years of design and production experience the new range of STOTZ CONTACTORS may be supplied open or in metal or bakelite housings.



SLA 6 (6 Amp) SLA 10 (10 Amp) SLA 20 (20 Amp) SLA 30 (30 Amp) SLA 40 (40 Amp) SLA 60 (60 Amp)

Other STOTZ products:—

- MINIATURE CIRCUIT BREAKERS
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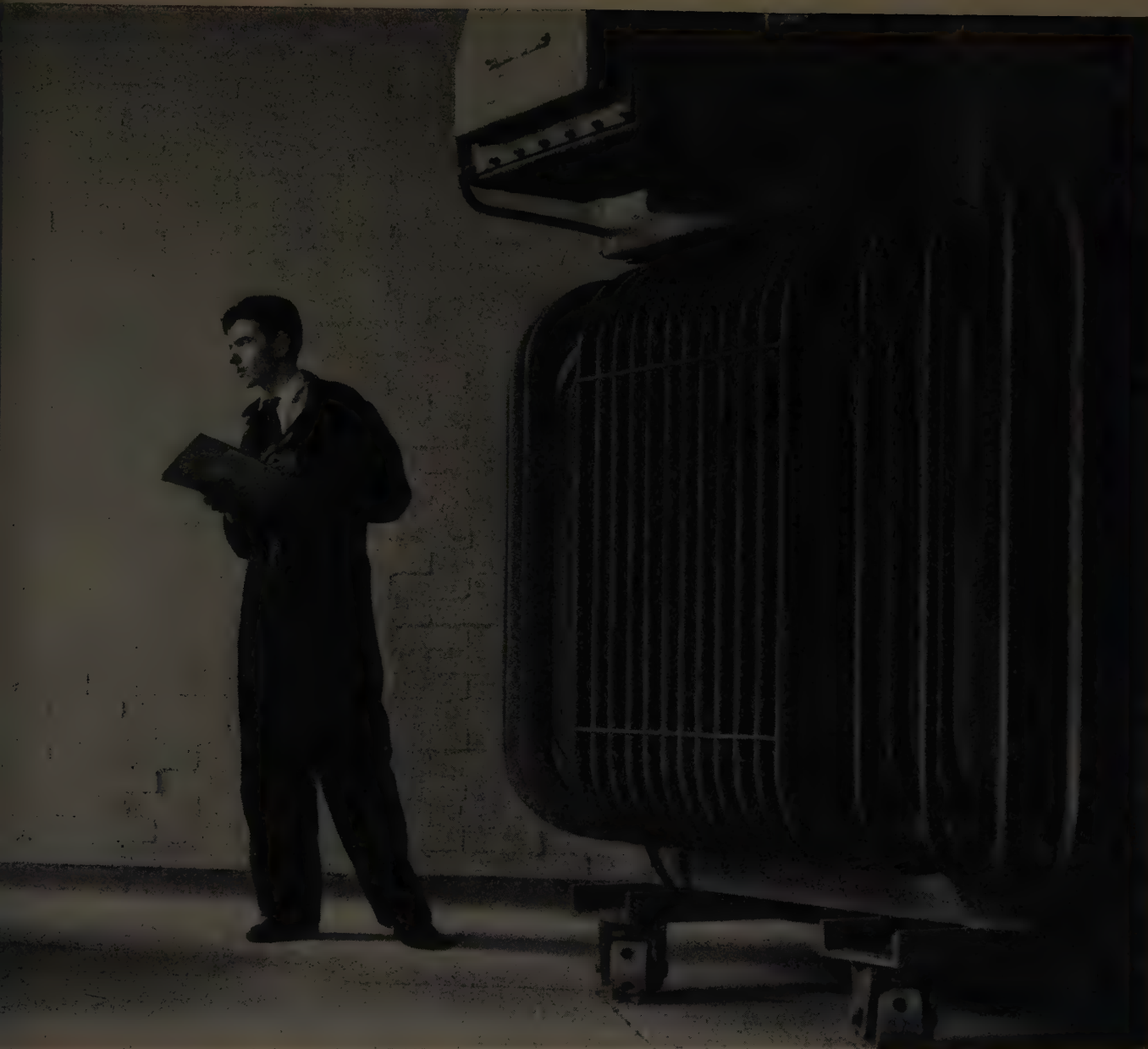
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PYROCLOR TRANSFORMERS

for new **G.P.O. building**



Pyroclor-filled transformers supplied by: Foster Transformers Ltd., South Wales Switchgear Ltd.



On Tuesday, 11th April, the Lord Mayor of London opened the G.P.O.'s Fleet Building at Farringdon Street.

SAFE-ANYWHERE TRANSFORMERS Pyroclor is fire-resistant, so transformers do not require special bunkers or fire-proof vaults. And there is no need for fire-fighting equipment.

TROUBLE-FREE TRANSFORMERS Pyroclor transformers give reliable service even in dusty, damp or corrosive atmospheres. What's more, maintenance demands are negligible.

SITED-ANYWHERE TRANSFORMERS Pyroclor transformers can be placed anywhere convenient. Sited at load centres they eliminate long, costly, low-tension runs and consequent voltage drop.

Distribution transformers with ratings from 50KVA to 3,000KVA and above. Write today for more information on Pyroclor.

PYROCLOR—SAFE, TROUBLE-FREE, CONVENIENT—TRANSFORMERS



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ENGLISH ELECTRIC

H.R.C. CARTRIDGE FUSE-LINKS



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ADMIRALTY & INTERSERVICE



SEMI-CONDUCTOR RECTIFIER PROTECTION

THE STANDARD OF QUALITY AND PERFORMANCE THE WORLD OVER

FUSEGEAR DIVISION, EAST LANCASHIRE ROAD, LIVERPOOL, 10
The English Electric Company Limited, English Electric House, Strand, London, W.C.2.

INDUSTRIAL NEWS (continued)

COMPUTER TAPE UNIT

A NEW computer magnetic tape transport unit, known as the Type 4000, has been introduced by Decca Radar, Ltd. This unit can be employed with any digital computer and is claimed to be the most advanced computer tape unit available in the world. Features of the equipment are complete absence of computer programme restrictions, quietness in operation, the provision of automatic loading and unloading routines, simplicity in design and operation, and the absence of maintenance adjustments. Wide margins of performance and continuous rating of components are characteristics of the design, ensuring reliability, serviceability and freedom from scheduled or unscheduled maintenance.

Two versions of the unit with similar electrical and mechanical parameters are available for handling $\frac{1}{4}$ in and $\frac{1}{2}$ in magnetic tape. The standard cabinet contains one tape transport, electronic circuits, manual control panel with logical interlocks, head amplifier circuits, and power and vacuum supplies.

Less than 2 millisecon is required from the receipt of the start signal until the tape is running and remains running at the specified speed in correct registration with the head. At a tape speed of 150 in/sec the length of tape lost from use during starting and

stopping is less than 0.3 in. Dual write/read heads are available at 0.39 in spacing to provide for immediate



Decca Type 4000 computer magnetic tape unit

check-back of recorded information. When this system is used a typical inter-block gap is only about 0.7 in,

giving improved tape utilisation. Standard data rates are 45,000, 90,000 and 180,000 characters per second.

The unit incorporates pneumatic drive of the tape, which technique permits rapid but smooth accelerations and decelerations to be achieved yet maintaining correct registration of the tape with the head. The unit also employs large capacity bins as tape reservoirs giving ample time for smooth acceleration of the tape reel. The tape content of these reservoirs is automatically maintained between the necessary limits by a servo system employing an induction motor and saturable reactors. The equipment is fully transistorised.

PASSOUT TURBO-GENERATOR FOR PAPER MILLS

The General Electric Co., Ltd., has received an order from the Reed Paper Group for a 5 MW passout geared turbo-generator and the associated condensing plant, valued at approximately £125,000. It will be installed alongside two existing G.E.C. sets in the Group's Empire Paper Mills at Greenhithe, Kent.

Designed for inlet steam conditions of 600 p.s.i.g. and 800°F, the turbine will exhaust to a vacuum of 28½ in Hg. The turbine will be fitted with a pressure-controlled passout for delivery of up to 80,000 lb/hr of process steam at 20 p.s.i.g. The condensing plant will be manufactured by Hick Hargreaves & Co., Ltd.

The layout of the two existing sets in the mills is unusual in that the condensers are arranged axially with condenser tube withdrawal under the turbine, and air-cooler tube withdrawal under the exciter. This was done to avoid demolishing the robust concrete foundation blocks which were originally constructed for steam engines. The new 5 MW set is to replace an existing set and will be installed on the same foundations, with the condenser also arranged axially.

Pumps for British Guiana

A contract valued at £31,540 has been received by Gwynnes Pumps, Ltd., from the main contractors, Pauling & Co., Ltd., on behalf of the Government of British Guiana for the Tapakuma Irrigation Project. The order is for two 42 in vertical-spindle axial-flow pumps equipped with siphon discharges driven through bevel gears by 276 b.h.p. Ruston & Hornsby 5-cylinder diesel engines. Sir William Halcrow & Partners are the consulting engineers.

Barking Station Lighting

THE new station recently opened at Barking is part of the London, Tilbury and Southend railway electrification scheme and follows the complete re-modelling of tracks, and the provision of a new signal box and accommodation for the technical departments of the Eastern Region and railway operating staff of London Transport.

The lighting in the circulating area of the concourse is by cold cathode tubes in the form of an illuminated fascia on three sides of the perimeter, and also by a number of floodlight type fittings on the black concrete supporting structure. A number of concealed floodlights illuminate the ceiling. In the ticket office and ticket collecting areas, reflector type fluorescent tubes are housed in natural light openings so that the artificial light emanates from the same source as the natural light. Platforms are illuminated by the standard range of cold cathode fittings designed for the

Eastern Region, each bearing the station name. Internally illuminated train indicators have been installed on each platform.

A train-actuated train announcing system for Eastern Region services has been installed which enables operating staff in the adjoining signal box to pre-select announcements for four trains in succession. The announcements are pre-recorded on an endless magnetic tape 3 in wide, which accommodates 25 separate announcements.

The electrical installation was carried out by Haines & Sheppard, Ltd. The General Electric Co., Ltd., supplied the public address equipment and the cold cathode fittings on the platform open areas, while those in the concourse and under the awnings were made by Ionlite, Ltd. Train indicators were produced by Falk, Stadelmann & Co., Ltd., and other fluorescent fittings were supplied by Atlas Lighting, Ltd.

INDUSTRIAL NEWS *[continued]*

Bulb Turbines for the Awe Scheme

THE North of Scotland Hydro-Electric Board has recently placed a contract with the Armfield Hydraulic Engineering Co., Ltd., for the supply and erection of two "bulb" type water turbo-generators for the Awe Barrage in Argyllshire. These two units will be the first such machines to be installed in the United Kingdom.

The barrage, which is situated near the outlet of Loch Awe, will serve to divert the flow of water into a new tunnel being provided to supply the hydro-electric plant at Inverawe power station near the outlet of the River Awe. Loch Awe will also constitute the lower reservoir of the new Cruachan pumped storage project which will be the first major scheme of this type to be brought into operation by the North of Scotland Hydro-Electric Board.

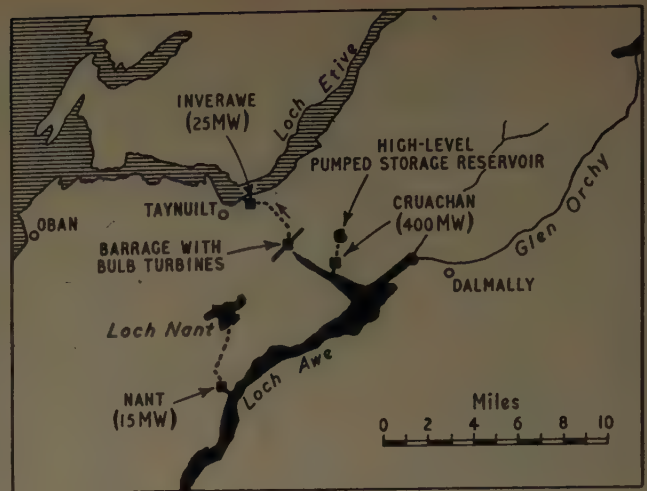
The units supplied for the Awe barrage will each be designed to develop 695 h.p. at a net head of 22.5 ft. After careful consideration, "bulb" units were selected by the Board as they are particularly suitable for the conditions which will prevail at the barrage. The Armfield Hydraulic Engineering Co., Ltd., who act as main contractors, are supplying "bulb" turbines manufactured by Ets. Neyrpic, Grénoble, driving induction genera-

tors made by the Société Alsthom of Paris.

The "bulb" units will be similar to machines already supplied by Ets. Neyrpic for various installations in France (see the description of the Rance scheme in our issue of 22nd September, 1961).

Commissioning of the "bulb" units is expected to take place in August, 1962. The work on the barrage is already well advanced and the turbine embedded parts are scheduled for site erection by May, 1962. The electrical

and mechanical consulting engineers for the Cruachan and Inverawe section of the Awe scheme are Messrs. Merz & McLellan whilst the civil consulting engineers are Messrs. James Williamson & Partners.



Map of the Awe scheme

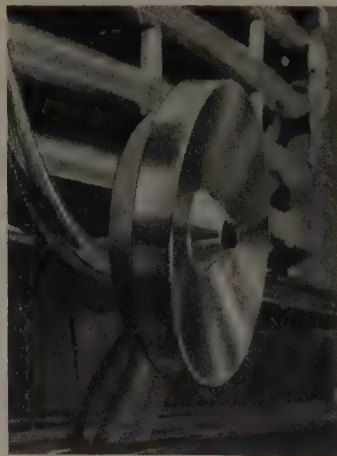
ROAD ICE DETECTOR

APPARATUS for mounting on a private car or commercial vehicle to indicate the possibility of ice formation on the road has been developed by Findlay Irvine, Ltd., of Penicuik, near Edinburgh. A series of tests carried out by the company showed that under the conditions most likely to cause icing—no cloud or wind—the air temperature at a height of about 9 in above the road surface would be no more than $3\frac{1}{2}^{\circ}\text{F}$ above the road surface temperature. Even under the conditions least likely to cause icing, if the air temperature at a height of 9 in was 32°F ice would inevitably be present on the road.

The equipment developed, known as the "Icelert," consists of a sensing

probe which can be mounted on the front of the vehicle and a dashboard warning lamp. The circuit makes use of the temperature sensitive characteristic of a transistor, its varying output being used to govern the frequency of flashing of the indicator light until at freezing point the lamp is continuously illuminated.

The circuit, contained in the external unit, is potted in paraffin wax to prevent water ingress. One of the two output leads is taken to the lamp and the other to the ignition fuse so that the unit is energised when the ignition is switched on. The unit, comparatively insensitive to air speed variations, responds in 0.2 sec to a 2°F change in air temperature at 30 m.p.h. The price is £5 17s 6d for the standard model and £7 17s 6d for the de-luxe version, which incorporates a lamp dimming control and a "push-to-test" switch.



Detector unit of the Findlay Irvine "Icelert" mounted on a car bumper apron

Nuclear Collaboration with Pakistan

The United Kingdom Atomic Energy Authority and the Pakistan Atomic Energy Commission are to develop their collaboration to promote the peaceful uses of atomic energy. The chairmen of the two bodies, Sir Roger Makins and Dr. Usmani, who have been attending the General Conference of the I.A.E.A. in Vienna, have exchanged letters defining their mutual interests. Provision has been made for staff consultations as well as for assistance and advice on the uses of radio-isotopes, particularly new uses which may be of special interest to Pakistan. The eventual supply by the United Kingdom of nuclear research and power reactors for civil uses in Pakistan is also envisaged.

LARGE CABLE CONTRACT

The South of Scotland Electricity Board has placed a contract with Scottish Cables, Ltd., for approximately 900 miles of mains, pilot and auxiliary cables for voltages up to and including 33 kV at a price of over £1½ million.

Distribution System at New University

Crompton Parkinson, Ltd., have been awarded the contract for the high voltage electrical distribution scheme at the University of Sussex, Brighton. This involves the provision and installation of 11 kV switchgear, transformers and ring main cables for the various substations. The architect for the new university is Sir Basil Spence, R.A., and the electrical consulting engineers Messrs. Steensen, Varming & Mulcahy, of London.

Electrical Industry and Europe

PAST successes of British light and domestic appliance manufacturers in Europe augur well for this side of the industry. This conclusion in a new booklet, "If Britain Joins," by the Economist Intelligence Unit (price 6s), is followed by a warning that "the heavy sector—which is already having difficulties in third markets against its European competitors—will face serious problems when the home market is opened. A lot will depend on how much progress has been made in the rationalisation process which is under way."

The booklet, which is sponsored by the National Union of Manufacturers, provides a useful summary of the considerations that business men should already be thinking about and acting upon as a result of Britain's application to join the Common Market.

The difficulties of the heavy sector are stated to be the basic reason for the electrical industry's unsatisfactory comparison with its Common Market counterparts. The authors believe that what lies behind Britain's lack of competitiveness is higher costs—partly at least the result of less specialisation than is found in the European industries. The well-organised electronic and specialised radio equipment industries, they say, have shown par-

ticular ability to compete in this market. "It now remains for the whole industry to become as alive to the challenge and potential of the Common Market as many manufacturers in the light sector already are. A number of firms are studying the market carefully, making co-operative export efforts and establishing closer trade relations, particularly in matters of standards and design, with Continental manufacturers. This involves a considerable change from traditional trade patterns."

Pumps for Swedish Reactor

Four large heavy-water pumps have recently been supplied by Hayward Tyler & Co., Ltd., to De Laval Ljungstrom Pumps AB. for installation in the Swedish Government's R3/Adam nuclear power reactor. These pumps, believed to be the largest of their kind in the world, are totally enclosed, wet stator, glandless electrical units of 250 h.p., and are constructed almost entirely of stainless steel. They are assembled under clean conditions to exclude any traces of organic substances, and have been successfully tested for freedom from leaks by high vacuum equipment and the use of helium gas.

BRENTFORD EXHIBITS AT ZAGREB

THE exhibits shown by Brentford Transformers, Ltd., at the recent Zagreb International Fair in Yugoslavia, on a joint stand organised by Guest Industrials, Ltd., included a 5 kVA tail end booster for use on rural distribution lines, an 8 kVA air cooled voltage stabiliser for G.P.O. use, and a standard 100 A regulator arranged

in exhibition form with a transparent tank wall. Photographs of other products, including the "Interstep" regulator units, were displayed on a wall panel. The regulator aroused considerable interest in the electrical industry in Yugoslavia, and a number of inquiries have been received as a result of this first visit to the country.



President Tito at Brentford Transformers' stand

ELECTRICAL INSTALLATION IN LETCHWORTH FACTORY

The new £4 million extension at Borg-Warner's Letchworth factory has been fully cabled by British Insulated Callender's Cables, Ltd. Apart from high voltage supply cables, the factory area is fed by 250 A, four-pole overhead busbar trunking for all machine units up to 60 A per phase. For heavier loads, 16 power distribution boards have been placed in suitable positions on stanchions. To serve welding plant, other than portable welders, a separate substation with two 11,000/415 V 750 kVA transformers has been provided. These welding appliances, some of which have a peak current demand of 2,000 A, are fed from a special panel by heavy copper busbars in steel trunking and p.i.l.c. wire armoured cables. The electrical installation was carried out by William Steward & Co., Ltd.

Trade Announcements

The Rawlplug Co., Ltd., has purchased additional factory premises known as Brent Works, Colindale Avenue, Hendon, N.W.9, formerly owned by the Tilley Lamp Co., Ltd.

Hoover, Ltd., announce the following staff appointments in their sales-service organisation:—Mr. A. A. Hutchison, northern divisional manager, Leeds; Mr. J. M. Geeson, Scottish branch manager, Glasgow; Mr. W. A. Sinclair, district manager, Edinburgh. Mr. A. McKay, formerly Edinburgh district manager, will become western branch manager, Bristol.

Ampex Great Britain, Ltd., have moved to new premises at 72, Berkeley Avenue, Reading (telephone: Reading 55341). Hitherto, the company has shared premises at Reading with its sister manufacturing company, Ampex Electronics, Ltd., and the move will make available additional space for that company, both for manufacturing and development.

The Sales Department of R. & A. Main, Ltd. (Electrical Division), has been transferred to the company's Gothic Works, Edmonton, London, N.18 (telephone: Edmonton 3030). Orders and dispatch instructions should, as hitherto, be addressed to the company's depots at Edmonton, Falkirk, Padiham or Bristol.

The telephone number of Mullard Equipment, Ltd., Crawley New Town, Sussex, will be changed to Crawley 28787 on 23rd October.

NEW ELECTRICAL EQUIPMENT

INDUSTRIAL ELECTRONIC RELAY

The industrial electronic relay announced by ELCONTROL, LTD., Wilbury Way, Hitchin, Herts., is available as a single unit, ER4, and as a double unit, ER5. A contact displacement of some 0.00001 in will complete the pilot circuit and operate the relay, which can be used to increase the sensitivity of devices based on limited contact movement and negligible contact pressure. In such applications, the relay is interposed electrically between the controlling element and the controlled circuit.

The ER4 relay can be supplied to operate in two alternative modes, being energised or de-energised when the pilot circuit is completed. Construction features include a printed circuit and a multi-primary transformer, mounted in a gasketed dust- and moisture-proof case having a cast alloy base and a sheet steel cover. The relay is provided with a dust-tight cover. The overall dimensions are 9 in by 7½ in by 4½ in projection. The relay contacts comprise one normally open and one normally closed, each rated at 5 A 250 V a.c. with a non-inductive load. A 112 V, 225 V or 440 V power supply can be accepted, selected by a plug. The relay ER5 is similar but embodies two independent control circuits on the same chassis, with two control relays. Prices are £13 5s for the ER4 and £16 for the ER5.

MULTI-PURPOSE TRANSFORMER

The resin-cast multi-purpose transformer made by SMITH HOBSON, LTD., Hersham Trading Estate, Walton-on-Thames, Surrey, is known as the "Factotum" and is made from a continuous ring of cold-rolled silicon iron wound with two identical coils which may be used in series, parallel, or independently. A third coil may be put on by hand as required, converting the unit into a current or voltage transformer or a heavy current supply transformer. Two units side-by-side may be used as a transducer or magnetic amplifier.

When used as a current transformer, the instrument can have ratios of 1 : 1, when the accuracy to B.S. 81 is class C at 15 VA or class BM at 5 VA; 250 : 1 with the windings connected in parallel, the accuracy being to class C

at 15 VA or class BM at 5 VA; and 500 : 1 with the windings in series, accurate to class BM at 20 VA or class AM at 5 VA. Other ratios can be obtained by winding multiple turns on the transformer ring. Employed as a 1 : 1 ratio voltage transformer of the isolating type, using both windings, the accuracy is to class A at 5 VA or class B at 25 VA. When used as a power transformer and supplied at 50 c/s from a 250 V source, the output is 1,000 A at 0.5 V with a single turn round the ring and the coils in series. By winding more turns the voltage and current may be varied, e.g. with 500 turns the output would be 2 A at 250 V.

The overall dimensions are 8 in high, 3 in deep, and 6½ in across the coil diameter. The weight is approximately 13 lb and the inside coil diameter is 2½ in.

TOGGLE SWITCHES

A series of toggle switches introduced by DOWTY ELECTRICS, LTD., Tewkesbury, Gloucestershire, comprises four basic units—one, two, three and four pole, each fitted with heavy duty contacts capable of switching 20 A with a resistive load at 28 V d.c. All units can be fitted with a variety of contact arrangements covering both two- and three-way operation. The operating dolly can have three positions, up, central and down, or any pair of these. Normally the dolly will remain at the setting at which it is released but it can be fitted with a spring return to central, operating from either or both sides.

Synthetic rubber seals round the base of the dolly shaft seal the interior

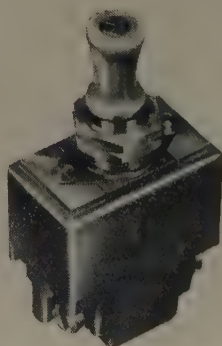
of the switch against moisture and dust. The mechanism incorporates a firm detent and operates with a snap action. If the dolly is operated slowly, the contact pressures remain at the maximum until the dolly reaches its critical point after 12° of movement. A further 1° of movement will cause the contacts to change over as the mechanism includes a secondary positive drive which is capable of breaking a light weld between contact faces.

MINIATURE WELDING TORCH

The Tec water-cooled miniature argon torch for welding non-ferrous metals announced by INTERLAS, LTD., 9, Church Street, Ampthill, Bedford, has a head height including transparent nozzle of only 1½ in and uses a tungsten electrode 1½ in long. It will accommodate electrodes of 0.01, 0.02, 0.03, 0.04, ⅛, ⅜ and ½ in diameter. It is capable of welding up to 300 A continuous duty cycle, weighs approximately 2.5 oz and has an overall length of 6½ in. The price of the torch is £30 and that of the No. 655 accessory kit, including two "Vycor" nozzles, four chucks and a chuck wrench, is £6 5s.

TRANSISTORISED CABLE AND PIPE LOCATOR

METAL DETECTION, LTD., Bickford Road, Witton, Birmingham, 6, announce a transistorised cable and pipe locator, comprising an oscillator unit, receiver unit, search coil and earphones. For locating underground pipes the oscillator unit is attached to one end of the pipe and the position is determined by the indicating meter in the receiver unit and with the earphones. A similar technique



Dowty Electronics toggle switch



Metal Detection cable and pipe locator

Maughan plug-in relay



is employed for electrically isolated cables but in this instance the extreme end of the cable must be earthed. The oscillator unit is not required for locating energised cables since the receiver unit will detect from the 50 c/s radiated power in the cable. The unit is provided with batteries, and is light and portable for field use.

FINE WIRE BUTT WELDER

The range of fine wire welding equipment produced by SPEMBLY, LTD., New Road Avenue, Chatham, Kent, has been extended by the introduction of a precision wire butt welder. This is used in conjunction with the company's capacitor discharge power pack and is able to weld both similar and dissimilar materials. Accurate concentric alignment of wires from 0.04in diameter down to 0.006in diameter is obtainable. The device consists of a base and two wire holding members.

The stationary component carries a precision quick-release collet to enable one wire to be aligned in two planes by micrometer controlled vee slides. The moving component carries a clamp for securing the second wire which can differ in diameter from the first. Both components are insulated from the base and are fitted with electrode leads for connection to the Mk. II power pack.

Once the wires are loaded with a finite gap between them, and the correct voltage and capacity settings have been selected in the power pack, welding is carried out by rotating the controlling screw, thus bringing the

two wires together and completing the discharge circuit. Wire alignment is facilitated by rotating a magnifying head through two planes at 90° to each other. Alternatively a twin viewing head can be provided giving stereoscopic vision.

PLUG-IN RELAY

The type DMP compact, plug-in relay recently developed by G. H. MAUGHAN, LTD., 13, Aspinall Street, Manchester, 14, embodies a large continuously rated coil and an iron circuit with permanent air gap. The contact arrangement is three-pole change-over, rated at 7.5 A (1,250 VA) a.c., and 7.5 A (500 W) d.c. Adequate pressure and wipe on all contacts ensures self-cleaning and eliminates bounce. The cover is of impact extruded aluminium, and all ferrous parts are cadmium plated. The shock resisting moulded base carries silver plated pins, matched to a 12E international valve base. The armature is secured with a steel leaf spring.

This unit can be mounted in any plane and has a high resistance to shock and vibration. It is flash tested at 2,500 V, 50 c/s between all circuits. The overall dimensions are 3¼in by 1½in by 2¼in and the weight is 5½ oz.

TELEVISION PROJECTION TUBES

The introduction of four new projection tubes for use in monochrome and colour television and other applications where high brightness displays of large area may be required is announced by the ENGLISH ELECTRIC VALVE CO., LTD., Chelmsford, Essex. The four tubes differ only in their screen properties and have the basic designation T929, with suffixes R, G, B or W denoting the fluorescent colour of the screen as red, green, blue or white, respectively. Designed for use with Schmidt optical systems, these tubes give a projected picture size up to 9ft by 12ft from an image covering the useful tube screen area of 72 mm by

96 mm. A precision, optically ground face-plate ensures a high degree of focus uniformity at the large lens apertures necessary for these applications, and the highlight brightness on a typical tube is of the order of 6,500 millicandela/sq cm.

ZENER DIODES

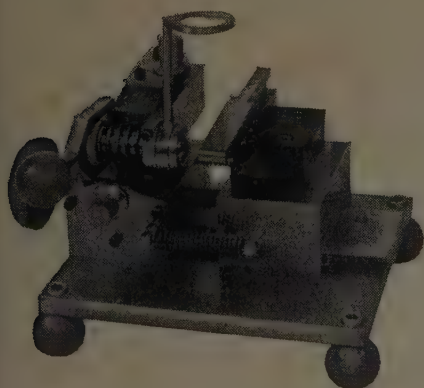
The SZA/C series of silicon zener diodes manufactured by the GENERAL ELECTRIC Co., LTD., Semiconductor Division, School Street, Hazel Grove, Stockport, Cheshire, formerly with ±10 per cent tolerance, now has a nominal tolerance of ±5 per cent and extends from 5.6 V to 33 V. Maximum mean power dissipation at 40°C is 1.5 W and the diodes are enclosed in a double-ended case with wire leads and a threaded base.

The diodes are numbered SZ56A to SZ91A and SZ10C to SZ33C with nominal zener voltages of 5.6 V to 33 V, graded according to the international preferred values of the 10 per cent increment series. Typical temperature coefficient of breakdown voltage varies between +0.02 per cent/°C for SZ56A to +0.09 per cent/°C for SZ33C.

NUMERICAL INDICATOR TUBE

The cold cathode numerical indicator tube announced by MULLARD, LTD., Mullard House, Torrington Place, London, W.C.1, has a life expectancy of 30,000 hours provided the display is changed from one numeral to another more than once in 100 hours, or 5,000 hours with a continuous display of any single numeral. An additional feature of the Z520M tube is a built-in optical filter which ensures maximum readability of the numerals under all conditions likely to be met in practice—even direct sunlight.

The numerals are displayed in characters ⅝in (15.5 mm) high. The tube can be operated with a supply voltage of 170 V and a cathode current of 2 mA is recommended. It may be operated by applying either a steady d.c. voltage or a negative pulse to the appropriate cathode. Physical dimensions are: 28.5 mm (±1.5 mm) diameter by 25 mm (±1.5 mm) seated height. The tube has a B13B base.



Spemby fine wire butt welder

INTERNATIONAL FILM CONGRESS

FROM A CORRESPONDENT

THE fifteenth Congress of the International Scientific Film Association was held in Rabat, Morocco, from 16th to 27th September. The general pattern of the programme was similar to that of previous years. Sections devoted to research, education, and the popularisation of science held viewing sessions to screen the 165 films submitted.

In each section diplomas were awarded—nine each by research and popular science and eight by education. Only one British film was awarded a diploma—A.E.I.'s "Electron Microscopy—An Introduction." This briefly surveys the development of the light microscope, shows its limitations, and demonstrates how the use of electrons enables these limitations to be overcome in the much more powerful electron microscope. The film includes some excellent examples of observations with the instrument, and the quality of its photography and exposition aroused many favourable comments.

Research Studies

In the research section there were some excellent examples of contemporary film making—notably the unusual French study in which X-ray cinematography of blood flow in the arteries of a dog was supplemented by sound recordings of the pumping action obtained by introducing a miniature microphone into an artery. The East Germans had an experimental television recording of microscopic unicellular objects, claiming that the use of television increased illumination one hundred times compared with cinemicrography. Of particular interest was an original Italian study of "Luminous Particles Flying Round the Arc Lamp of a Street Lamp"—a good example of the value of film in visually recording physical phenomena.

East German entries included two films of special electrical interest: "Heterogeneousness of the Electromagnetic Field," a study made by filming an electromagnetic field under a powerful electric current, and "The Circulation of Electromagnetic Waves," which included observations of magnetic fields in the troposphere and ionosphere.

In addition to their diploma winner, A.E.I. had their neat teaching film "Analysis of Solids with the MS7 Mass Spectrometer," notable for its excellent photography, simple exposition, and the complete absence of background music or other sound. The Educational Foundation for Visual Aids film "Prelude to Power—the Story of Faraday and the Induction Ring" was a good example of a simple teaching film, and also a useful indication of the results which can be obtained by the collaboration of several countries in a film-making project for wide educational use. This film, like the two A.E.I. films, is already available in Britain.

The Roumanians, who are not afraid to experiment with many different types of film (including a delightful study of "Element 14—Silicon" which made imaginative

use of the animation of silicon particles as a link in an otherwise straightforward exposition), had included a teaching film on "Semiconductors" which explained their origin and atomic structure and discussed some of their practical applications. The Russian entry was not nearly so exciting as in some previous years, and made the poorer because their eagerly-awaited film on the space flight of Major Titov got entangled somewhere in the red tape which still manacles the cultural interchange of films between countries. But their diploma winner on "Colour Television" was an excellent example of visual exposition which could be readily understood by a correspondent who could not follow the Russian commentary.

But in the world of film, as elsewhere, one is quickly made aware of the overlap of subjects and the interconnection between many fields of knowledge and human thought. Thus the Hungarian entry "On the Fire Road" used a variety of techniques from straight filming to cartoon and trick photography to relate the story of man's development of fire. This led up to a plea for the peaceful uses of atomic energy, but the impact was weakened by the fact that it was only in connection with atomic energy that the film emphasised that there was a choice of potential uses, for the good or to the disadvantage of mankind. At the purely scientific level Unilever's beautiful "Outline of Detergency" seemed an unlikely context in which to encounter electricity, and yet the film gave a very effective illustration of the fact that in the functioning of a detergent electrical repulsion plays an important part as the detergent solution acts as an electrolyte.

ROLLED COPPER FOR ELECTRICAL USE

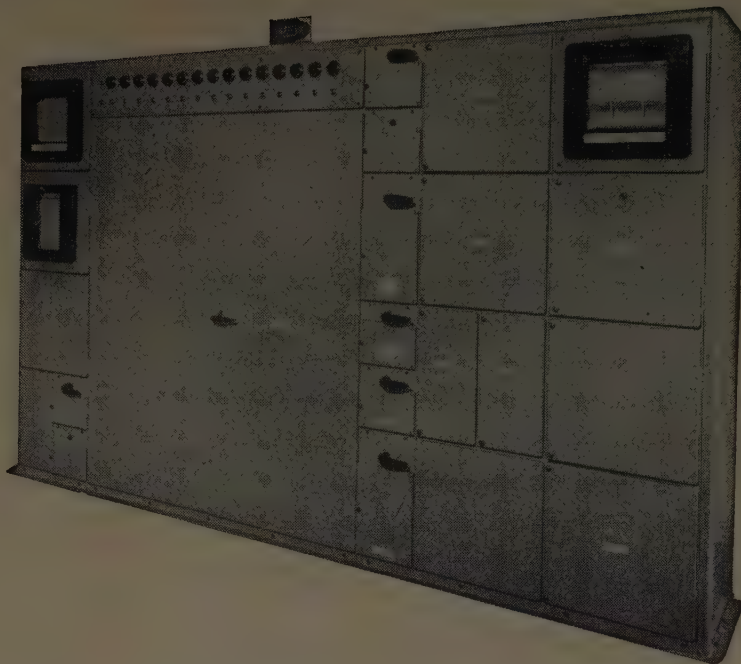
THE British Standards Institution has recently published a revision of B.S. 899 covering rolled copper sheet, strip and foil. The original standard of 1940 and the revision of 1952 both related to material for general purposes, but this revision has extended the scope to include material for electrical purposes in the form of rolled sheet and strip. This material was previously covered by B.S. 1432 which is now being revised. Its scope will be restricted to strip with drawn or rolled edges.

The wording and general arrangement of clauses in the new revision of B.S. 899, and tolerances specified, are in line with those included in B.S. 2870, a standard soon to be published dealing with rolled copper and copper alloys in sheet, strip and foil form. The electrical requirements comply with the recommendations of B.S. 1989 "Memorandum on values for the properties of high-conductivity copper." The standard covers dimensions and tolerances, the selection of test samples and mechanical and electrical tests.

Copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 6s each.

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CENTRAL ELECTRICITY GENERATING BOARD

TARIFF FOR BULK SUPPLIES TO AREA BOARDS

fixed by the Central Electricity Generating Board (the Generating Board) pursuant to section 37 (1) of the Electricity Act, 1947, for the year ending 31st March, 1963.

KILOWATT CHARGE IN RESPECT OF SUPPLIES OTHER THAN FOR SPECIAL CONSUMERS

£8 per kilowatt of that proportion of the prescribed national demand of 29,000,000 kilowatts which the average demand of the Area Board bears to the sum of the average demands of all Area Boards and the average demands of all direct consumers of the Generating Board.

BASIC DAY RUNNING CHARGE

0.58d. for each kilowatt-hour supplied during the sixteen hours between 7.0 a.m. and 11.0 p.m. of each day during the year.

BASIC NIGHT RUNNING CHARGE

0.47d. for each kilowatt-hour supplied during the eight hours between 11.0 p.m. and 7.0 a.m. of each day during the year.

FUEL COST ADJUSTMENT RATE

The above basic day and night running charges to be increased or reduced by 0.000495d. for each penny (a halfpenny or any greater part of a penny being treated as a penny) by which the fuel cost per ton in the year shall be above or below 85 shillings.

KILOWATT CHARGES IN RESPECT OF SUPPLIES FOR SPECIAL CONSUMERS

- (i) £8 per kilowatt of the sum of the nominated firm kilowatts and the excess kilowatts.
- (ii) £8 less a rebate of £4.2.0 per kilowatt of the restrictable demand or, in the case of application to an existing load, such reduced rebate during an initial period of 3 years as will reflect the savings which the Generating Board expect to make by the restriction of demand.

For the above purposes:—

- (A) "The average demand of the Area Board" means the sum of the number of kilowatt-hours supplied to that Board for consumers other than special consumers during
 - (i) the half-hour in which the highest number of kilowatt-hours was supplied by the Generating Board to all Area Boards and direct consumers before midnight on 31st December in the year of account,
 - (ii) the half-hour in which the highest number of kilowatt-hours was so supplied after midnight on 31st December in the year of account.
- (B) "The average demands of all direct consumers of the Generating Board" means the sum of the number of kilowatt-hours supplied to such consumers not being special consumers during
 - (i) the half-hour in which the highest number of kilowatt-hours was supplied by the Generating Board to all Area Boards and direct consumers before midnight on 31st December in the year of account,
 - (ii) the half-hour in which the highest number of kilowatt-hours was so supplied after midnight on 31st December in the year of account.
- (C) "Special consumers" means a consumer who has agreed that (without prejudice to any statutory right to discontinue the supply of energy) his kilowatt demand can be restricted by the Generating Board for up to 2 hours on any occasion and up to an aggregate of 50 hours in the year provided that
 - (i) the supply is afforded to the consumer's premises directly from a generating station or substation of the Generating Board through circuits not used for supplies to other consumers;
 - (ii) the difference between the maximum demand of the special consumer and his nominated firm kilowatts shall be not less than 25,000 kilowatts;
 - (iii) suitable provisions have been made in respect of the costs of connection and the technical arrangements for operation, control and metering, which may vary with local circumstances;
 - (iv) prior agreement has been made between the consumer, the Area Board, and the Generating Board, in the case of a consumer of the Area Board;
 - (v) the payment of a charge for excess kilowatts on one occasion will not entitle the special consumer to exceed his nominated firm kilowatts without additional charge during any subsequent period of restriction.
- (D) "Restrictable demand" means the difference between the
 - (i) maximum demand of the special consumer, and
 - (ii) the nominated firm kilowatts and excess kilowatts of that consumer.
- (E) "Maximum demand of a special consumer" means twice the largest number of kilowatt-hours supplied to the special consumer during any half-hour between 7.0 a.m. and 7.0 p.m. on any day except Saturdays, Sundays and Bank Holidays.

- (F) "Nominated firm kilowatts" means the five-minute kilowatt demand which in accordance with the above arrangements the special consumer is entitled to make during a period of restriction. For this purpose "five-minute kilowatt demand" means twelve times the number of kilowatt-hours supplied to the special consumer in any consecutive five minutes.
- (G) "Excess kilowatts" means the amount by which the nominated firm kilowatts is exceeded by twelve times the largest number of kilowatt-hours supplied to the special consumer in any five minutes (excepting the first five minutes) during any period commencing when the Generating Board indicate (by a signal or otherwise) that they require his demand to be restricted in accordance with the above arrangements, and ending when the Generating Board indicate that normal supply may be resumed.
- (H) "Fuel cost per ton" in any period shall be either
 - (i) the quotient produced by dividing the aggregate of the product of the Area fuel cost per ton in the period and the number of kilowatt-hours supplied from generation in the Area in the period, and the product of the residual cost per ton in the period and the number of kilowatt-hours imported into the Area if any in the period by the number of kilowatt-hours supplied in the Area in the period; or
 - (ii) the Area fuel cost per ton;
 whichever is the less.
- (I) "The Area" means the Area of the Area Board taking the supply.
- (J) "The Area fuel cost per ton" in any period shall be determined as follows: the total cost of fuel consumed in the period at all the Generating Board's stations in the Area shall be divided by the total number of tons of fuel so consumed and the cost per ton so obtained shall be multiplied by 11,000 and divided by the average gross thermal value of fuel so consumed expressed in British thermal units per pound.
- (K) "Fuel" shall mean coal coke and oil fuels but shall not include atomic fuels.
- (L) "The cost of fuel consumed" shall mean the sums expended for fuel consumed plus the cost of any transport, handling preparation or treatment incurred in connection with the delivery of the fuel to boiler hoppers or furnaces and in connection with the disposal of the products or residues of combustion, together with the proper proportion of salaries and wages and any contributions for pensions, superannuation and insurance of officers and servants attributable thereto and the amount of any rebate allowed by the suppliers from the price of heavy fuel oil delivered at the Generating Board's stations, such rebate being attributable only to a specific quantity of heavy fuel oil so delivered, less any sums received from the sale of any products or residues of combustion.
- (M) "The number of kilowatt-hours supplied from generation in the Area" in any period means the number of kilowatt-hours (being kilowatt-hours generated by the combustion of fuel) sent out from all the stations of the Generating Board in the Area in the period or the number of kilowatt-hours supplied in the Area in the period whichever is the less.
- (N) "The number of kilowatt-hours supplied in the Area" in any period shall mean the number of kilowatt-hours supplied in the period by the Generating Board to the relevant Area Board and to other consumers in the Area.
- (O) "The number of kilowatt-hours imported into the Area" means the amount if any by which the number of kilowatt-hours supplied in the Area exceeds the number of kilowatt-hours supplied from generation in the Area.
- (P) "The residual cost per ton" in any period shall mean the aggregate of:—
 - (i) The quotient produced by dividing the amount by which the national fuel cost per ton in the period multiplied by the aggregate of the number of kilowatt-hours supplied in the Area of each Area Board in the period exceeds the aggregate of the respective products in the case of each Area Board of (a) the Area fuel cost per ton in the period and (b) the number of kilowatt-hours supplied from generation in the Area in the period, by the aggregate of the number of kilowatt-hours imported into the Area of each Area Board in the period; and
 - (ii) the sum of 6s. (six shillings).
- (Q) "The national fuel cost per ton" in any period shall be determined as follows: the total cost of fuel consumed in the period at all the Generating Board's stations shall be divided by the total number of tons of fuel so consumed and the cost per ton so obtained shall be multiplied by 11,000 and divided by the average gross thermal value of the fuel so consumed expressed in British thermal units per pound.

INDUSTRY AND THE HOUSE

The Recent Government Changes

By **AUSTEN ALBU, M.P., B.Sc., A.M.I.Mech.E., M.I.P.E.**

WHATEVER else one may think of last week's changes in the Government, the appointment for the first time of a professional electrical engineer to be President of the Board of Trade is an event which will be welcomed by readers of this journal. Mr. F. J. Erroll served an apprenticeship with Metropolitan-Vickers and took the Mechanical Science Tripos at Cambridge and his appointment is not only a recognition of his own qualities, but also of the importance of industry, and in particular engineering, to our economy. Mr. Erroll has had a good deal to do with export promotion recently and the alarming trade figures published this week show that he has still much to do if we are to get out of the wood, whether he is successful or not. Perhaps your contributor may be allowed to hope that this appointment of a former writer of these articles has created a precedent for the future.

Mr. Erroll is to be assisted by Sir Keith Joseph as Minister of State. Sir Keith is an intelligent and energetic young Tory business man who has made a good impression on the House as Parliamentary Secretary to the Ministry of Housing and Local Government. A Fellow of All Souls, he was before he became a Minister a director of a group of building and civil engineering companies. He has taken a particular interest in training for management and was one of the founders of a fund for supporting such training at the universities.

Industry and Economic Policy

The new combination should help to strengthen the industry side of the Board; but whether or not they can succeed depends as much on general economic policy as on their own efforts and whether Mr. Erroll's voice will be strong enough in the Cabinet remains to be seen. He will certainly need to maintain the closest co-operation with other Ministers vitally concerned with the problems of improving the efficiency and ability to change of British industry: not only with the Chancellor of the Exchequer, but also with the Ministers of Labour and Education and the Minister for Science.

When one turns to the other Cabinet changes it is difficult to feel reassured. Many motives must influence a Prime Minister in making such changes and a politician, especially if he is a member of the Opposition, may perhaps be excused for looking for those of political strategy which must always play a major part. No one doubts that Mr. Macmillan is starting to prepare his general staff for the next electoral battle. He is also no doubt preparing the ground for the younger men who must one day succeed him and his older colleagues—perhaps even with an eye to his own successor. That is what is so intriguing about Mr. McLeod's appointment and, even more, about his unexpected success at the Tory Party conference.

What is, however, of more immediate importance and especially to readers of this journal, are the new arrangements at the Treasury. These are frankly confusing.

The appointment of Mr. Henry Brooke as a second Cabinet Minister at the Treasury is puzzling. Mr. Brooke has a reputation for hard work and attention to detail and has had previous experience as Financial Secretary to the Treasury, but his main experience has been in local government and in the Ministry which deals with local authorities. He undoubtedly has a first-rate knowledge of the problems of Government expenditure, although his most well-known action in his previous position was the Rent Act, a measure which appeared to have been based on inadequate information and which brought him some unpopularity. Neither he, nor the Chancellor of the Exchequer, are inspiring speakers and it is still difficult to see from whom the lead for a new spirit in British industry is going to come.

Planning Machinery

The Prime Minister, in announcing his changes, reminded us of the enormous burden of work that now falls on Treasury Ministers. This arises out of the growth in public expenditure, the control of the investment programmes of the nationalised industries and the new responsibilities for the general co-ordination of national economic policy. There has been talk for several months of some new machinery of economic planning on the lines of the French Commissariat du Plan and, if this were to be established, there might well be need for a senior Minister to take charge of it. So far, however, there appear few signs of any Government move in this direction. All that appears to be envisaged is an attempt to strengthen the existing tripartite consultative machinery so as to get some co-ordination of industrial investment plans and to persuade the trade unions to modify their wage demands. The French system certainly uses these methods, but only after an elaborate econometric study has been made and its implications made clear to each sector of industry. The consultative committees which have been set up in each French industry have some pretty hard statistical information to chew on. Whether or not anything on these lines is established here, there will remain the possibility of divided responsibility. Mr. Brooke is to work under the general direction of the Chancellor; but he has for several years run his own major department and is hardly likely to look on his new post as a demotion—and what is the function of Lord Mills, now Minister without Portfolio, a close friend of the Prime Minister and, for several years now, his industrial *eminence grise*? Perhaps a rather younger mind needs to be brought to bear on the confused picture which British industry today presents.

Nor is there much time to spare, with Mr. Heath boldly plunging into the previously chilly waters of the Common Market. Now he, too, is to have an overlord, in the person of Mr. Butler, who is to lead the group of Ministers in charge of the Common Market negotiations. Mr. Butler's reactions to the changing fortunes of his political

career are always fascinating to observe and many had thought that, in view of his previously expressed views, he might have tried to recover some of the popularity he had lost with his Party's right wing for his liberal policies at the Home Office, by leaning towards his prejudices against our entry into the Common Market. But both Mr. Butler's policies on crime and Mr. Heath's defence of the Government's decision on the Common Market received surprisingly large support at the conference and, unless there are more serious rebuffs to come in Brussels than seems likely at present, opposition from Government supporters to its European policy will probably diminish.

Whatever the difficulties which our application undoubtedly creates for the Government in Commonwealth relations, in domestic agricultural policy and in our relations with our partners in E.F.T.A., any going back

on the forthright statement made by Mr. Heath in Paris, in which he wholeheartedly accepted the principles laid down in the Rome Treaty, would have an extremely bad effect in the countries of the "Six." They have welcomed our application; they now believe, as they did not before, that it is being made in good faith and they are undoubtedly at this moment more willing than might have been expected to help us by negotiating over our difficulties. In particular, the change in the French attitude, which is to be seen not only in Paris, but also among French delegates to the assemblies of the Council of Europe and Western European Union, has been most remarkable. Unless the Government gets cold feet from its sudden plunge, the negotiations may proceed farther than anyone has so far thought possible and industry had better start girding its loins to follow.

Large Capacitor Installation

A POWER capacitor bank, believed to be the largest of its kind in Europe, has been designed, manufactured and erected by British Insulated Callender's Cables, Ltd., for Ferranti, Ltd., at Hollinwood. It will be used for proving tests on large power transformers such as the 400 MVA, 380/275 kV, three-phase, 50 c/s auto-transformer recently ordered from Ferranti by the Central Electricity Generating Board.

From those systems open to consideration for transformer testing, the capacitor method was chosen as affording the quickest and most economical means of obtaining a larger test supply. The fact that an existing synchronous condenser could be used as a 60 c/s alternator was an influential factor as it facilitates tests on transformers for the United States.

The capacitor bank is situated outdoors and is connected to the secondary side of a 15 MVA test transformer. It has two 33.6 MVAR sections which are electrically

identical and these are connected in parallel to give a total available output of 67.2 MVAR at 60 c/s. The bank comprises 2,688 units of 336 racks and is connected to the transformer test area by twin overhead plain aluminium conductors. It is served by incoming busbars rated to carry 3,000 A r.m.s. continuously.

The overhead conductor system is terminated on a gantry inside the transformer production building. Two-way off-loading isolating switches are mounted on the gantry and these are used to connect the test transformer and capacitor bank to the transformer under test; they are also employed to short-circuit and earth the capacitor bank terminals after isolation from the supply, on completion of a test.

In the case of some tests the capacitor bank must be connected in star with the neutral point floating. Because of this an additional isolating switch is provided on the main outdoor switch gantry to permit the floating neutral point to be connected to earth prior to personnel entering the capacitor compound. After entering the capacitor compound on completion of a test, the standard procedure is to close all isolating switches using insulated operating poles. Thereby each rack is individually short circuited and it facilitates setting up the bank for a subsequent test.

Connection of the capacitor bank to the secondary side of the test transformer enables a comparatively small transformer and associated regulator to be used for testing transformers rated up to 400 MVA. This form of connection has the additional advantage that once the bank has been set up for testing a given transformer no change in setting is required for alternative tests which are sometimes necessary at different ratings.

The use of the capacitor bank in association with the 6 MVAR synchronous condenser and the 15 MVA test transformer enables a test load of up to 70 MVA to be provided without exceeding 8 MVA from the North Western Electricity Board. The design of the capacitor bank affords considerable flexibility in terms of voltage and kVAR settings. This is most useful because the reactive kVA needed for a test varies even for transformers of the same rating. It is possible to set up the bank for a test in 15 minutes.



View down passage of stacks of 25 kVAR capacitor units forming a 67.2 MVAR 66 kV bank at Ferranti's Hollinwood works

REGULATORS FOR G.P.O. TELEPHONES — BY BRENTFORD



The G.P.O.'s nationwide trunk telephone system calls for a large number of repeater stations, many of which are equipped with A.C. motor generating sets to which are connected Brentford Voltage Regulators. These Brentford Regulators hold the voltage supply constant to within $\pm 1\frac{1}{2}\%$ they do not affect the wave form in any way and operate for very long periods without maintenance.

Technical details The Brentford Regulators supplied to the G.P.O. can be used for any nominal input voltage between 200 and 250 volts single phase, variable by $\pm 15\%$ at any frequency between 45 to 52 cycles. They can be arranged for any other voltage or frequency bank as required.

Brentford Transformers Limited, Manor Royal, Crawley, Sussex. Telephone: Crawley 25121

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Full details and application forms have been sent to the Head Teachers of Grammar and Public Schools throughout Great Britain. Additional copies, and further information, may be obtained from:

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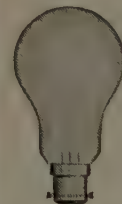
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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 23rd OCTOBER

Birmingham.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Centre, Electronics and Measurement Group. "Space-Charge-Limited Dielectric Devices—Successors to the Transistor," by G. T. Wright.

Chamber of Commerce, 75, Harborne Road, Edgbaston, 6.30 p.m. I.E.S. Birmingham Centre, "Floodlighting in Colour," by J. W. Bessant.

Bristol.—Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Centre, Utilisation Group. Chairman's address by Dr. H. G. Taylor on "Research in the Field of Electricity Utilisation."

Grand Hotel, 8 p.m. A.S.E.E. Bristol and West of England Branch. Film.

Gardiner, Sons & Co., Ltd. I.E.S. Bath and Bristol Centre, "The New I.E.S. Code," by H. Hewitt.

Chester.—Town Hall, 6.30 p.m. I.E.E. North Western Centre. Joint meeting with the Mersey and North Wales Centre. "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," by W. Carson and H. J. Sheppard.

Harwell.—Reactor School, A.E.R.E., 7.30 p.m. A.S.E.E. Oxford and Districts Branch. "Servomechanism Components and Their Applications."

Leeds.—British Lighting Council, 24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. "Office Lighting," by R. G. Hopkinson.

Leicester.—Demonstration Theatre, East Midlands Electricity Board, Charles Street, 6.15 p.m. I.E.S. Leicester Centre. "The New I.E.S. Code," by W. E. Harper.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. informal meeting. Discussion on: "Is Automation Making Satisfactory Progress?" to be opened by Prof. A. Tustin.

Newcastle-on-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "Silicon Power Rectifiers," by A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams.

Norwich.—Assembly House, 7.30 p.m. I.E.E. East Anglian Sub-Centre. "British Nuclear Power Today," by A. L. Shaw.

Salford.—Royal College of Advanced Technology, 6.15 p.m. I.E.E. North Western Centre, Education Discussion Circle. Discussion on: "How Long do we go on Teaching our Subject Historically," to be opened by E. R. Laithwaite and P. Hammond.

Stoke-on-Trent.—North Staffs. College of Technology, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "The Development of Communication, Indication and Telemetering Equipment for the British Grid," by G. A. Burns, F. Fletcher, C. H. Chambers and P. F. Gunning.

TUESDAY, 24th OCTOBER

Cheltenham.—Belle Vue Hotel, 7.30 p.m. Society of Instrument Technology, Cheltenham Section. "Instrumentation in Ice Cream Manufacture," by E. H. Higham.

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. Sub-Centre chairman's address by Prof. W. E. J. Farvis.

Glasgow.—Scottish Building Centre, 425, Sauchiehall Street, C.2, 7 p.m. Institution of Heating and Ventilating Engineers, Scottish Branch. "The Heating of Buildings by Off-Peak Electricity Supplies," by N. MacLean and E. Harrison.

39, Elmbank Crescent, C.2, 6.30 p.m. Institution of Engineers and Shipbuilders in Scotland. "The Atom in the Future," by W. R. Wootton.

Department of Natural Philosophy, University, 7.15 p.m. Institute of Physics and the Physical Society, Scottish Branch. "Some Aspects of Human Communication," by Prof. C. Cherry.

Liverpool.—Industrial Development Centre, Paradise Street, 6 p.m. I.E.S. Liverpool Centre. "The New I.E.S. Code," by H. E. Bellchambers.

Exchange Hotel, Tithebarn Street, 6.30 p.m. Institution of Heating and Ventilating Engineers, Liverpool and District Branch. Chairman's "At Home." "Radiant Heating—A Comparison of the Merits of Floor and Ceiling Applications," by A. Griffiths and P. S. Harris.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. "The Use of Analogue Computers in Predicting the Space-Time Behaviour of Nuclear Reactors," by R. W. Hockney and T. O. Jeffries.

E.A.W. Headquarters, 25, Foubert's Place, W.1, 6 p.m. Electrical Association for Women, London Branch. "Impressions of Greece and Spain," by Miss Mary George.

Manchester.—Engineers' Club, 6.15 p.m. I.E.E. North Western Supply Group. "A General Method of Digital Network Analysis particularly suitable for use with Low-Speed Computers," by M. N. John, and "Digital Computers in Power System Analysis," by P. P. Gupta and Prof. M. W. Humphrey Davies.

Wembley.—Hirst Research Centre, G.E.C., Ltd., 5 p.m. I.E.S. London meeting. Visit.

TUESDAY, 24th to THURSDAY, 26th OCTOBER

Torquay.—British Institute of Management. Sixteenth National Conference.

TUESDAY, 24th to FRIDAY, 27th OCTOBER

London.—Olympia. Royal Dairy Show.

WEDNESDAY, 25th OCTOBER

Barrow.—N.W.E.B. Demonstration Theatre, Duke Street, 7.30 p.m. I.E.E. North Lancashire Sub-Centre. "Submersible Pumping Plant," by H. H. Anderson and W. G. Crawford.

Christchurch.—King's Arms Hotel, 6.30 p.m. I.E.E. Southern Centre. "The Transmission of Speech through Narrow Bandwidths," by L. G. Stead.

Glasgow.—Grosvenor Restaurant. Electrical Contractors' Association of Scotland. Annual dinner-dance.

Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, C.2, 7.30 p.m. Institute of Marine Engineers, Scottish Section. "Elementary Nuclear Engineering," by H. F. Close.

Leicester.—University, University Road, 6.45 p.m. British Institution of Radio Engineers, East Midlands Section. "Achieving High Reliability in Electronic Equipment," by N. B. Griffin.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Electronics and Communications Section. Chairman's address, "Global Communication," by R. J. Halsey.

1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers. Presidential address, "Co-ordination in Engineering Research and the Conservation of Scientific and Technical Manpower," by Sir Kenneth Hague.

Micanite & Insulators Co., Ltd., Empire Works, Blackhorse Lane, Walthamstow, E.17, 2.15 p.m. I.E.E. London Graduate and Student Section. Visit.

School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6 p.m. British Institution of Radio Engineers, Computer Group. Symposium on "Digital Differential Analysers."

Connaught Rooms, W.C.2, 12.30 for 1 p.m. Batti-Wallahs' Society. Luncheon.

Rugby.—College of Engineering Technology, 6.30 p.m. I.E.E. Rugby Sub-Centre. Joint meeting with the Rugby Engineering

Society. "Electric Ship Propulsion with Special Reference to the S.S. Canberra," by L. W. W. Graham.

THURSDAY, 26th OCTOBER

Belfast.—Central Hall, Rosemary Street. A.S.E.E. Northern Ireland Centre. "The Art and Science of Lighting," by W. M. Pierce.

Birmingham.—College of Advanced Technology, Gosta Green, 6.15 p.m. I.E.E. South Midland Centre Education Discussion Circle. Discussion on "Some Recent Developments in Electroheat," to be opened by E. May.

Electrical Engineering Department, University, 6.15 p.m. British Institution of Radio Engineers, West Midlands Section. "Instruments for the First U.K. Scout Satellite," by Prof. J. Sayers.

Chester.—Stanley Palace, Watergate Street, 7 p.m. Society of Instrument Technology, Chester Section. "Radiation Pyrometry," by T. Land.

Croydon.—Greyhound Hotel, 8 p.m. A.S.E.E. South London Branch. "Navigation Lights: Manufacture and Servicing," by A. F. Burn.

Dundee.—Electrical Engineering Department, Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. Chairman's address by G. L. Doig.

Farnborough.—Technical College, 6.30 p.m. I.E.E. Southern Centre. Joint meeting with the Southern Branch of the Institution of Mechanical Engineers. "A General Theory of Depreciation of Engineering Plant," by D. Rudd.

London.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Joint meeting with the British Section of the Société des Ingénieurs Civils de France. "A Comparison between Generation and Transmission Problems in Great Britain and France," by P. M. J. Allieret.

Maidstone.—Royal Star Hotel. A.S.E.E. West and East Kent Branches. Joint annual dinner.

Southampton.—Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. "The Practical Application of the New I.E.S. Code," by P. G. Merritt.

FRIDAY, 27th OCTOBER

Aberdeen.—Robert Gordon's Technical College, 7.30 p.m. I.E.E. North Scotland Sub-Centre. Chairman's address by G. L. Doig.

Coventry.—Conservative Rooms, 16, Queens Road, 8 p.m. A.S.E.E. Coventry and District Branch. "The Revision of British Standards and Their Effect on Motor Applications," by F. T. Bartho.

Crewe.—Royal Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "The Lighting of Offices," by D. Whipp.

Isle of Wight.—S.E.B. Showrooms, Newport, 6.30 p.m. I.E.E. Southern Centre. "Safety in the Utilisation of Electricity," by S. J. Emerson.

Kettering.—George Hotel, 9 p.m. I.E.E. East Midland Centre. Dance.

Liverpool.—Canning Dock, 7.15 p.m. Institution of Plant Engineers, Manchester and Merseyside and North Wales Branch. Joint meeting aboard Clubship Landfall. "Why are there not more Engineers at Board Level?"

London.—Quaglin's Restaurant, Bury Street, S.W.1, 6.45 for 7.15 p.m. Faraday House Old Students' Association. Dinner.

Sheffield.—Grand Hotel, 7 p.m. Institute of Metal Finishing, Sheffield and North East Branch. "Recent Developments in Bright Silver Plating."

Weymouth.—South Dorset Technical College, 6.30 p.m. I.E.E. Southern Centre. "The Psychology of Study," by Prof. C. A. Mace.

Financial Section

STOCKS and SHARES

BABCOCK & WILCOX joined the lengthening list of prominent firms to report a deterioration in trading results during the first half of the current year. The impact of their decision to make no interim dividend payment seemed to be partly responsible for the beginning of another sharp and general relapse in industrial share prices. Markets fell further into dejection after the appearance of poor overseas trade figures for September, and of markedly less optimism in the Federation of British Industries' latest survey of business conditions. Investors have been showing much more interest in gilt-edged securities: there have been gains of up to 2 points in Government stocks since the small cut in Bank Rate.

Babcock & Wilcox

After the passing of the interim dividend Babcock & Wilcox £1 shares fell 3s to 20s 3d. This is less than a quarter of the prices reached in the days before the revelation of serious losses on nuclear power contracts, and of surplus manufacturing capacity in some branches of the industry, brought disillusionment to the holders of many shares in the field of heavy electrical and general engineering. In their interim statement, the directors of Babcock & Wilcox refer to various uncertainties which make it advisable to draw no conclusions about the final results for the year, and although they say that the order book is better now than at any time in the last four years they expect trading to remain highly competitive.

Depressed Markets

Shares of most of the big electrical groups, and of the heavy engineering firms associated with them, had depreciated to the extent of a further one to two shillings by the beginning of this week. Minor losses appeared plentifully in the price lists. Among the larger falls were those of 2s in Tube Investments, to 55s, and of 3s in Westinghouse Brake, to 25s: these prices were respectively 30s and 20s below the best recorded in the early part of the year. Hoover came back 3s 6d on a subsidence of the "bid" rumours, and Dimplex also gave up more than 3s of previous advances. A particularly sharp setback in Ultra Electric—which were 4s 9d down at

18s 9d—was ascribed to selling on American account.

Company News

Two bright exceptions to the depressed state of markets appeared in

the shares of Aron Meters and Holo-phane. Aron's 5s shares followed the previous week's rise of 2s with another of 8s, reaching 30s, on the news that the company's electricity meter business was being sold to Ferranti, Ltd., for a

Price Changes in

Company or Board	Nom. Value	Middle price 16th Oct.	Week's Rise or Fall	Dividend		Yield %	1961				
				Pre-vious	Last		High-est	Low-est			
Gilt-edged Stocks							£	s	d		
Brit. Elec. 1968/73	100	73	+1	3	3	4 2 3	75½			70½	
Brit. Elec. 1974/77	100	67	+½	3	3	4 9 6	70½			64½	
Brit. Elec. 1976/79	100	68½	-½	3½	3½	5 2 3	73½			67	
Brit. Elec. 1974/79	100	77	+1	4½	4½	5 10 6	82			75	
Brit. Elec. 1967/69	100	89½	+1	4½	4½	5 0 6	91½			86	
Overseas Electric Supply											
Calcutta Elec.	£1	21/3		7†	7½†	11 11 0	22/3			20/6	
East African Power	£1	13/-		8	10	15 7 9	15/-			13/-	
Nigerian Elec.	£1	19/-	+6d	10	14	14 14 9	19/9			15/6	
Perak Hydro-Elec.	£1	22/-		15	15	13 12 9	23/6			17/6	
Electrical Shares											
Aberdare Holdings	5/-	15/-	+3d	17½	17½	5 16 9	17/-			14/3	
Aerialite	1/-	4/9		54	54	11 7 0	8/-			4/6	
Allen, W. H.	£1	27/-	-1/3	14	10*	7 8 3	42/6			27/-	
Allied Insulators	5/-	8/9		20	10*	5 14 3	10/-			8/-	
Alwyn Holdings	5/-	21/-	-3d	12½	15½*	3 11 6	22/3			16/6	
Anglo-Portuguese Tel.	£1	20/-		9	9	9 0 0	25/-			18/9	
Arcoelectric	1/-	4/6		15	15	3 6 9	6/-			3/9	
Aron Meters	5/-	30/-	+8/-	15	15	2 10 0	30/-			17/-	
Assoc. Elec. Ind.	£1	28/9	-1/3	15	15	10 8 9	48/6			28/9	
Automatic Tel. & El.	5/-	17/-	-6d	17	17	—	20/-			12/9	
Babcock & Wilcox	£1	20/3	-3/6	9	9	—	36/6			19/-	
Bakelite	10/-	46/3		17½	17½*	3 15 9	60/-			42/-	
Baldwin, H. J.	2/-	1/-		10	Nil	—	1/9			1/-	
Berry's Electric	5/-	57/6		30	33½*	2 17 6	57/6			37/-	
Bowthorpe Holdings	2/-	8/-x.d.		18½	22	5 10 0	10/3			7/9	
Brit. Elec. Resistance	2/-	6/9		17½	17½*†	5 3 9	8/9			6/6	
Brit. Elec. Traction:											
Def. Ord. "A"	5/-	48/6	-6d	40	50	5 3 0	57/6			41/9	
British Electronic Ind.	5/-	11/3		—	15	6 12 6	15/3			8/9	
B.I. Callender's	£1	55/-	-1/3	13½	13½	4 18 3	62/3			49/6	
B.I. Callender's 6% Pref.	£1	16/6		6	6	7 5 6	18/3			16/6	
British Thermostat	5/-	30/9	-6d	20	27½	4 9 6	40/-			28/-	
Brook Motors	10/-	51/3	-6d	25	25*	4 17 6	55/-			47/-	
Bulgin, A. F.	1/-	12/3		55	40*	3 5 3	13/3			7/9	
Bulpitts	5/-	17/-	-9d	15	16½	4 15 6	27/6			16/9	
Burco Dean	5/-	6/9		18	15	11 2 3	11/9			6/3	
Cable & Wireless	5/-	16/3	-6d	10	10*†	3 1 6	19/9			12/6	
Cambridge Instruments	5/-	31/6	-6d	12½†	22	3 9 9	38/6			30/-	
Chloride El. Storage "A"	£1	75/-		17½	20	5 6 9	91/-			72/-	
Clarke Chapman	£1	40/-	-6d	13½	13½	6 17 6	54/-			37/6	
Clarke, T.	2/-	4/-		16	16	5 6 9*	5/3			3/6	
Combined Elec. Mfrs.	4/-	7/-		—	12½	7 2 9	10/-			6/9	
Contact Switchgear	5/-	13/-		14	14	5 7 9	16/-			12/9	
Cossor, A. C.	5/-	7/6		Nil	Nil	—	8/-			5/6	
Crabtree	10/-	23/6		20	12½*	5 6 6	33/9			23/6	
Crompton Parkinson	5/-	11/3	-6d	14	12½*	5 11 0	14/6			11/3	
De La Rue	10/-	49/3	-2/-	22½	22½*	4 11 6	70/-			49/3	
Decca "A"	10/-	55/-x.d.	-2/9	23½	23½	4 5 0	70/-			52/3	
Desoutter	5/-	55/-		30	35	3 3 9	68/9			49/-	
Dewhurst	2/-	5/6		20	20	3 12 9*	6/6			3/9	
Dictograph Tel.	2/-	10/6		20	20*	3 16 3	13/-			8/6	
Dimplex	5/-	83/-	-3/3	30	35*	2 2 3	86/3			47/-	
Dubilier Condenser	1/-	2/-	-3d	30	15*	7 10 0	3/-			2/-	
Duport	5/-	10/6		17½	20	6 7 0*	17/-			10/6	
E.M.I.	10/-	37/-	-1/6	17½	17½	4 14 6	51/3			35/3	
Eleco	2/-	8/3	+3d	20	20*†	4 17 0	10/6			4/3	
Electrical Apparatus	5/-	18/6		14½	20	5 8 0	21/-			17/-	
Electrical Components	5/-	9/-		11½	12½	6 19 0	9/9			7/9	
Elec. Construction	£1	21/3	-1/9	9	5	4 14 0	39/-			20/3	
Elliott-Automation	5/-	34/3	-9d	9.3	13	1 18 0	37/6			25/6	
Enfield Rolling Mills	£1	37/6	-6d	15	15	8 0 0	51/6			37/6	

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
 * After scrip issue. † Free of income tax. ‡ Dividend indicated.

sum of £440,000. The board foresees ample opportunities for the development of the company's other interests, and are confident that the proceeds of the sale can be put to more profitable use. Holophane 5s shares were marked

up to 16s 9d after the company's report of an improvement in profits from £106,000 in 1959-60 to £112,000 in the year ended last June, and the maintenance of the dividend at the total of 30 per cent to which the rate was

raised a year ago. The yield on the shares approaches 9 per cent.

Hackbridge Prospects

For the year ended last March, Hackbridge Holdings reduced the interim dividend, but when the twelve months finished with trading profits almost level with those of 1959-60 the deficiency was made good in the final payment, which brought up the total to 10 per cent. In reviewing this year's prospects, the chairman anticipated a repetition of quite satisfactory results. The year had started with extensive orders in hand, there had been an encouraging demand for the products, and the company constantly sought to diversify its range by the introduction of new manufactures. A yield of nearly 8½ per cent on the 5s shares at a price of 5s 9d reflects the fact that after deduction of increased depreciation and tax charges the latest net surplus barely covers the amount of the dividend.

Decca's Good Results

Decca reported an increase of some 10 per cent in the group trading profit for the twelve months ended last March, despite a contraction of £700,000 in turnover during the period. This evidence of an improvement in profit margins came as a welcome relief from the story usually told these days in company reports, and in happier market surroundings it might well have had a better reception. In the event, there was little reaction to the news and the "A" shares remained 2s 9d down on the week at 55s x.d. After larger provisions for interest charges, depreciation and taxation, the net surplus for the year came out a little lower than before at approximately £1½ million, but this again provides two-fold cover for the unchanged dividend of 2s 4d per share.

W. H. Sanders' Report

Earnings of W. H. Sanders (Electronics) contracted a little to £94,000 during the twelve months ended last June, but it is explained in the full report that production and sales of certain units were delayed so that the full benefit of recent development expenditure was not realised during the period. The 17½ per cent dividend is shown by the accounts to be covered well over three times by profits available for distribution. This no doubt is one factor in the quotation of the 2s shares, at 16s 6d, on a yield basis only just above 2 per cent, and another would be the directors' expression of confidence in the future of the business, given more manufacturing space and labour. The question of additional finance is receiving active consideration.

Electrical Investments

Company or Board	Nom. Value	Middle price 16th Oct.	Week's Rise or Fall	Dividend		Yield %	1961	
				Pre-vious	Last		High-est	Low-est
Electrical Shares—continued						£ s d		
English Electric ...	£1	26/3	—1/3	10	10	7 12 6	40/9	26/3
English Electric 3½% Pref. ...	£1	9/9		3½	3½	7 13 9	11/9	9/9
Ericsson ...	5/-	29/6	—9d	13½	13½	—	32/-	22/3
Ever Ready ...	5/-	36/3	—1/3	20	22½	3 2 0	40/-	31/6
Falk Stadelmann ...	£1	21/9		10	7½	6 18 0	26/-	21/9
G.E.C. ...	£1	24/3	—1/3	10	10	8 5 0	39/6	24/3
G.E.C. 6½% Pref. ...	£1	16/6		6½	6½	7 17 6	19/3	16/6
General Cables ...	5/-	4/9		15	Nil	—	6/3	4/9
G.H.P. Group ...	£1	20/-	—1/-	6	7½	7 0 0	24/6	17/-
Goblin (B.V.C.) ...	5/-	4/6		12½	10	11 2 0	8/6	4/3
Hackbridge Holdings ...	5/-	5/9	—3d	20	10*	8 14 0	6/9	5/-
Harland Engineering ...	5/-	12/-	—9d	16	16	6 13 3	19/-	12/-
Head Wrightson ...	5/-	22/-	—6d	14	16	3 12 9	30/-	22/-
Heatrae ...	2/-	15/-		12½	25	3 6 9	19/-	12/6
Holophane ...	5/-	16/9	+1/9	30	30	8 19 0	20/6	14/6
Hoover ...	5/-	50/-	—3/6	90	45*	4 10 0	55/6	37/6
Hunt, A. H. ...	4/-	17/6		20	20	4 11 6	25/9	17/6
Intl. Combustion... ..	5/-	23/-	—6d	30	30	6 12 0	33/9	23/-
Intl. Computers & T. ...	£1	86/3	—4/3	10	11½	2 12 3	107/-	59/-
Johnson & Phillips ...	£1	20/3	—9d	Nil	5	4 18 9	24/-	17/6
Kenwood Mfg. ...	1/-	3/3	—3d	—	—	—	6/-	3/3
Laurence Scott ...	5/-	14/3		15	15	5 5 3	18/9	14/3
Lister, R. A. ...	£1	48/9	—1/3	14	14	5 14 9	56/9	45/6
Lucas, J. ...	£1	51/3	—1/3	12½	13½	5 7 3	71/6	52/6
Marryat & Scott ...	2/-	16/9		27½	32½	3 17 6	18/6	13/9
Mather & Platt ...	£1	36/-	—9d	11	11	6 2 3	51/6	36/-
Metal Industries ...	£1	47/6	—3/9	15	15	6 6 3	66/6	47/6
Midland Elec. Mfg. ...	£1	53/9	—2/9	12	12	4 9 3	67/6	53/9
Murex ...	£1	38/9	—1/3	20	13*	6 14 0	51/6	38/9
Newman Ind. ...	2/-	7/-		12½	15	4 5 9	7/6	5/-
Oldham & Son ...	1/-	2/9		17½	17½*	6 7 3	3/-	2/3
Parsons, C. A. ...	£1	47/6	—1/-	9½	12½	5 5 3	72/6	46/9
Philips' Lamps ...	Fl.10	205/-	+5/-	16	16*	1 11 9	£13½	£9½
Plessey ...	10/-	38/6	—3/-	17	15½†	3 18 0	45/-	35/3
Pullin Group ...	2/-	10/-	—3d	25	25	5 0 0	15/-	10/-
Pyrotexax ...	5/-	41/3		40	45	4 2 0*	48/9	34/9
Radiation ...	£1	23/-	—1/-	12	10	8 14 0	37/6	23/-
Reliance-Clifton ...	5/-	18/9		15	20	3 11 6	22/-	14/9
Reynolds ...	£1	37/6	—1/-	17½	9½*	5 4 0	51/6	36/6
Richardsons Westgarth ...	10/-	4/3		8½	Nil	—	8/3	4/3
Sangamo Weston ...	10/-	21/9		13½	10½*	4 12 0	25/9	18/9
Scott, James ...	5/-	30/-		25	27½	4 11 9	32/-	25/6
Simon Engineering ...	5/-	36/3	—1/6	—	27½	3 15 9	43/9	28/-
Smith (England), S. ...	4/-	14/-	—6d	17½	20	5 14 3	23/9	14/-
Southern Areas ...	£1	17/6		5	6	6 17 3	23/-	14/6
Strand Elec. ...	5/-	17/9		14-6	20	5 12 9	20/-	12/3
Sturtevant ...	5/-	9/-	—6d	15½	13½	11 17 0	18/6	9/-
Sun Elec. ...	5/-	14/3		15	18½	6 9 6	17/6	14/3
T.C.C. ...	10/-	41/3		35	22½*	5 9 0	43/9	40/-
Telephone Rentals ...	5/-	26/9		15	15½*	2 16 0	29/6	18/6
Thompson (John) ...	5/-	12/9	—9d	20	5	—	16/9	12/9
Thorn Elec. ...	5/-	57/6		25	25	2 3 6	63/-	44/6
Thornycroft ...	4/-	5/-	—6d	6	6	—	7/-	5/-
Tube Investments... ..	£1	55/-	—2/-	—	14	5 1 9	85/-	55/-
Ultra Electric ...	5/-	18/9	—4/9	20	25	—	31/3	12/6
Walsall Conduits ...	4/-	10/-	—3d	15	15	6 0 0	15/-	10/-
Ward & Goldstone ...	5/-	28/-	—9d	35	17½*	3 2 6	36/6	25/6
Watford ...	2/-	6/6	—6d	25	20*	6 3 0	10/9	6/6
Westinghouse ...	£1	25/-	—3/-	11	11	8 16 0	45/-	25/-
West, Allen ...	5/-	10/6	—3d	12½	13½	6 8 6	14/6	10/3
Wilkins & Mitchell ...	5/-	8/9		21	12	6 17 3	15/3	8/9
Wolf Electric ...	5/-	12/9	—3d	12½	13½	5 7 9	17/6	12/9

REPORTS and DIVIDENDS

Babcock & Wilcox, Ltd.—No interim dividend is to be paid on the company's ordinary stock. The directors say that, in reaching this decision, they have had regard to the company's provisional trading results for the year to date, which are affected by the low level of manufacturing activity in the earlier part of the year, by nuclear contracts (for which it is believed that provision has been made), and by a number of major outstanding claims on contracts still under discussion. In view of this it is the board's opinion that it would be unwise at this stage to draw any conclusion regarding the final results for the year.

Regarding prospects for the longer term, the level of manufacturing activity has increased and the order book now stands at a higher figure than at any time in the past four years; even so, capacity in the boiler manufacturing industry is in excess of requirements and trading conditions are likely to remain highly competitive.

Holophane, Ltd.—The net profit for the year ended 30th June last amounted to £111,746, as compared with £105,777 for 1959-60. After providing £56,600 (£51,300) for taxation there remains a balance of £55,146 (£54,477). A final dividend of 20 per cent on the ordinary stock is recommended, making 30 per cent (same) for the year; the carry-forward is increased from £114,218 to £123,426.

Stothert & Pitt.—Though the group profit fell from £1,008,328 to £737,395 in the year to 30th June last, the dividend is maintained at 20 per cent with a final distribution of 15 per cent. The directors state that the fall in profits is mainly attributable to the disastrous floods which occurred in October and December last year, and caused considerable dislocation in the company's works with serious loss of output.

Mavor & Coulson, Ltd.—Interim dividend 3½ per cent (the same).

New Companies

Electrad Central Heating Co., Ltd.—Registered 5th October. Capital £1,000. Heating and ventilating engineers, etc. Directors: R. J. Palmer and G. J. Davidson (secretary). Regd. office: 225, Oxford Street, W.1.

Trent Valley Refrigeration, Ltd.—Registered 1st September. Capital £5,000. Manufacturers of and dealers in refrigerators, etc. Directors: K. H. Trolley (secretary) and F. R. Haywood. Regd. office: 30, Willoughby Street, Nottingham.

Palmerston Electricity Services, Ltd.—Registered 26th September. Capital £100. Electricians, mechanical engineers, etc.

Directors: A. T. Cook and Mrs. Winifred A. Cook. Solicitors: Crofts & Ingram & Wyatt & Co., S.W.1.

Martin Parker, Ltd.—Registered 25th September. Capital £100. Manufacturers of and dealers in vacuum cleaners and component parts, etc. Secretary: S. H. Lucas. Regd. office: 6, Surrey Street, W.C.2.

E. Marchant (Electrical Engineers), Ltd.—Registered 22nd September. Capital £100. Directors: L. W. Harris and Florence L. Harris, both of 29, Harrow Lane, Maidenhead.

Norwest Services (Electrical), Ltd.—Registered 25th September. Capital £100. Electrical engineers, etc. Secretary: R. Rapstone. Regd. office: 19, Buckingham Street, W.C.2.

Weiner Development Co., Ltd.—Registered 25th September. Capital £100. Wholesalers, retailers, manufacturers of and dealers in transistor radio equipment, etc. C. Weiner is the first director. Secretary: A. A. Malnick. Regd. office: 73, Leadenhall Street, E.C.3.

General Colourvision Co., Ltd.—Registered 21st September. Capital £100. Television, colour television and communication company, etc. Directors: A. E. T. Comerford, J. J. Richmond and J. P. Comerford. Secretary: Madeleine E. Jones. Regd. office: Oxford House, Portsmouth Road, Thames Ditton, Surrey.

Murlen Transducers, Ltd.—Registered 21st September. Capital £100. Public address equipment and apparatus manufacturers and dealers, etc. Directors: L. W. Murkham and Patricia D. Murkham. Solicitors: Preston & Naylor, W.C.2.

Thomis & Moore (Electronics), Ltd.—Registered 21st September. Capital £1,000. Directors: L. Thomis, Miss Kathleen A. Laycock, C. Moore and Therese F. Thomis. Regd. office: Netherwood Chambers, Manor Row, Bradford, 1.

Archard Electrical Co., Ltd.—Registered 21st September. Capital £500. Electrical engineers, etc. Directors: S. G. Archard, J. Dowson and N. G. Archard. Secretary: Lily E. Dowson. Regd. office: Beaumont, Homestead Road, Ramsden, Bellhouse, Billericay.

Brett Electrical Co., Ltd.—Registered 9th October. Capital £100. Electrical engineers, etc. Directors: D. Brett and Sonya Brett (secretary). Regd. office: 12/13, Richmond Buildings, W.1.

Kelvin Electrical Industries, Ltd.—Registered 10th October. Capital £1,000. Directors: A. L. Foulger and D. W. Page (secretary). Regd. office: Kelvin Works, Hackbridge, Surrey.

Chevina Electrics, Ltd.—Registered 10th October. Capital £100. Electricians, etc. Secretary: Shirley Hart. Regd. office: 713, Imperial House, Kingsway, W.C.2.

Winding-Up Petition

Lowellectrix, Ltd.—A petition has been presented for the winding-up of the company and is to be heard before the Birmingham County Court on 14th November. Anyone wishing to appear should notify Claude M. Payne & Co., Lex House, 12, Manor Road, Coventry.

Liquidations

Winding-up proceedings or liquidations are often undertaken for the purpose of reconstruction, the transfer of a business, or other reasons. The appearance of a company's name under this heading therefore does not necessarily indicate insolvency.

Ranelagh (London), Ltd., 1, Colville Mansions, Flat 4, Powis Terrace, London, W.11, electrical contractors.—Liquidator, Mr. A. T. Cheek, Inveresk House, 346, Strand, London, W.C.2, released 29th September.

Philip Greene, Ltd., 242, Old Kent Road, London, S.E.1, electrical contractors.—First and final dividend of 1s 6d in the £ payable at 6, Cavendish Court, 11-15, Wigmore Street, London, W.1.

Spyrolex, Ltd., Marlestone Chambers, 517, Uxbridge Road, Hayes, Middlesex, electrical engineers.—Liquidator, Mr. G. F. Morris, Inveresk House, 346, Strand, London, W.C.2, released 21st September.

Bankruptcies

J. Vipond, 331, Clay Lane, South Yardley, Birmingham, 26, electrical sub-contractor; and formerly carrying on business at 6, Taunton Road, Sparkbrook, Birmingham, 12, as an electrical contractor.—Last day for receiving proofs for dividend 28th October. Trustee, Mr. W. L. Hand, Colmore House, 21, Waterloo Street, Birmingham, 2.

A. C. Hart, radio and electrical engineer, 256, High Street, Berkhamsted, Herts.—Receiving order made 2nd October on debtor's petition.

M. J. D. Jones, carrying on business in partnership with another at 14, Blackstock Road, Finsbury Park, London, N.4, as household electrical appliance dealers.—Public examination 24th November at the Court House, Church Street, Brighton.

J. A. Parker, carrying on business at 240, Chillingham Road, Heaton, Newcastle-upon-Tyne, and lately at 42, Huddleston Street, Cullercoats, Northumberland, under the style of Household Refrigeration, and formerly carrying on business at 23, St. Mary's Street, Cardiff, as Cardiff Vacuum Cleaner Co., electrical appliance dealer.—Public examination 5th December at the Court House, 56, Westgate Road, Newcastle-upon-Tyne.

E. Middleton, lately carrying on business as an electrical dealer under the name of Home Electrics at 83, Friargate, Preston, Lancs.—Public examination 17th November at the Sessions Hall, Lancaster Road, Preston. Trustee, Mr. R. A. Hawken, Bank Chambers, 1, John Street, London, W.C.1, appointed 5th October.

R. J. Bickerstaffe, formerly carrying on business as an electrical goods retailer under the styles of the Continental Electrical Co. and the R.J.B. Continental Electrical Co. at 24, Ormond Road, Richmond, Surrey, 31, Richmond Road, Kingston-on-Thames, and Dumfries Chambers, St. Mary Street, Cardiff, and under the style of Continental Electric (Cardiff), at 39, Castle Arcade, Cardiff.—Trustee, Mr. W. H. Meredith, County Court Buildings, Westgate Street, Cardiff, released 19th September.

A. S. Evans, residing and carrying on business at "Wayside," West Road, Bridport, Dorset, electrical contractor.—Application for discharge to be heard 26th October, at Bankruptcy Buildings, Carey Street, London, W.C.2.

B. L. V. Page, carrying on business under the style of Page Domestic Electrical Appliances at 77, Cleveland Street, Doncaster, and formerly at 33-34, Scot Lane, Doncaster, 7, North Way, Scarborough, 17, St. Sepulchre Gate, Doncaster, and also 7, London Road, Grantham, domestic electrical appliance retailer.—Receiving order made 22nd September on debtor's petition.

A. Rose, residing and carrying on business as an electrical contractor at 18, Roseberry Road, Norton, Stockton-on-Tees, and lately carrying on business as an electrical appliance dealer at 31, Dovecot Street, Stockton-on-Tees.—Public examination 1st December at the Court House, Bridge Road, Stockton-on-Tees.

J. W. Carrington and R. A. Fenn, carrying on business in partnership as Carrington & Fenn, at 25a, Angel Hill, Bury St. Edmunds, Suffolk, electrical contractors and retailers.—Receiving order made 25th September on debtors' petition. Public examination 17th November at the Shire Hall, Bury St. Edmunds.

Phoenix Enfield Supplies, 11, Napier Road, Ponders End, Enfield, Middlesex, electrical appliance retailers.—Receiving order made 28th September on a creditor's petition.

INTOL IN CABLES

INTOL for insulation and sheathing. INTOL for light and heavy duty flex. INTOL gives excellent abrasion resistance and tear strength with high tensiles and good ageing properties. INTOL is consistent in quality, stable in price and punctually delivered from stock. I.S.R.'s Technical Service is at the call of manufacturers at any time to test and advise on specifications for all grades of INTOL.



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London Tel: Lancham 9711 Cables INTOLRUB LONDON
Manchester Tel: Pyramid 1241 Cables INTOL MANCHESTER

Cossorscope model 1076

SPECIFICATION

CATHODE-RAY TUBE: 5 in. (12.7 cm) diameter screen, single-beam, operating at 10 kV. Green fluorescence—phosphor P1. Phosphors P7 and P11 available to special order. Display area 10 cm (horizontal) by 6 cm (vertical).

Y AMPLIFIER: Basic Model 1076; d.c. to 80 Mc/s (30% down); rise-time 5 μ sec; sensitivity 200 mV/cm. With plug-in unit Model 1078; rise-time 6 μ sec to 7 μ sec; 50 mV/cm to 50 V/cm calibrated. With plug-in unit Model 1080; d.c. to 1 Mc/s (30% down); 1 mV/cm to 50 V/cm calibrated (differential inputs). With plug-in unit Model 1081; 3 c/s to 40 Mc/s (30% down); rise-time 10 μ sec; 5 mV/cm to 2 V/cm calibrated or, d.c. to 60 Mc/s, 50 mV/cm to 20 V/cm. With plug-in unit Model 1085; d.c. to 40 Mc/s (30% down), dual-channel beam switch; rise-time 10 μ sec; 50 mV/cm to 20 V/cm calibrated.

SIGNAL DELAY: 150 m μ sec.

TIME-BASE: 24 calibrated ranges from 0.1 μ sec/cm to 5 sec/cm in a 1, 2, 5 series. Continuously variable un-calibrated ranges from 0.1 μ sec/cm to 12 sec/cm. Calibrated sweep expansion of $\times 1$ or $\times 5$ on all ranges from 0.1 μ sec/cm to 12 sec/cm. D.C. coupled bright-up pulse to CRT grid gives uniform brightness along the trace length and complete fly-back suppression on all ranges. Scan length: 10 cm.

TRIGGER: with plug-in unit Model 1079—five modes of operation, H.F. Sync, Auto, A.C. Fast, A.C. Slow, and D.C. With plug-in unit model 1083—as given above for model 1079 and also with calibrated delayed sweep ranges: 100 μ sec, 1 msec, 10 msec, 50 msec. With plug-in unit Model 1082—calibrated sweep delay from 2 μ sec to 10 sec. Separate trigger selection for main sweep and

delaying sweep. Trace may be displayed on delaying sweep. "Lock-out" delay for jitter-free operation.

X AMPLIFIER: with plug-in unit Model 1079—d.c. to 2 Mc/s. 1V/cm to 100 V/cm calibrated. With plug-in unit Model 1083 as given above for Model 1079.

CALIBRATION: Amplitude. A 1 kc/s square-wave calibration source provides eighteen fixed voltage levels from 0.2 mV to 100 V peak-to-peak in a 1, 2, 5 series. Accuracy is within 2 per cent.

Time. Basic calibration ranges are within ± 3 per cent. In addition, a gated 500 ($\pm 2\%$) Mc/s oscillator can be switched in to provide 2 μ sec intensity modulation dots for accurate measurement of pulse rise-times. Time marker pips are also available at 50 ($\pm 2\%$) Mc/s.

OUTPUT WAVEFORMS: time-base saw-tooth and gate; vertical-amplifier output; 1 kc/s calibrator square wave.

GENERAL: small neon indicators show the direction in which the CRT beam lies when deflected off the screen. An illuminated rotatable graticule with anti-parallax ruling in centimetre squares with 2 mm base, line divisions and green filter is provided. Fittings for camera attachment.

POWER SUPPLY: Mains. 100 V to 130 V and 200 V to 250 V. Frequency. 50 c/s to 100 c/s. Consumption. 650 W (approximate). Stabilized E.H.T., H.T. and transistor-stabilized d.c. heater supply to drift and hum-sensitive circuits.

SIZE AND WEIGHT: Height 18½ in. (47.0 cm). Width 13 in. (33.0 cm). Depth 29¼ in. (74.3 cm). Weight with two plug-in units 104 lb (47.3 kg).

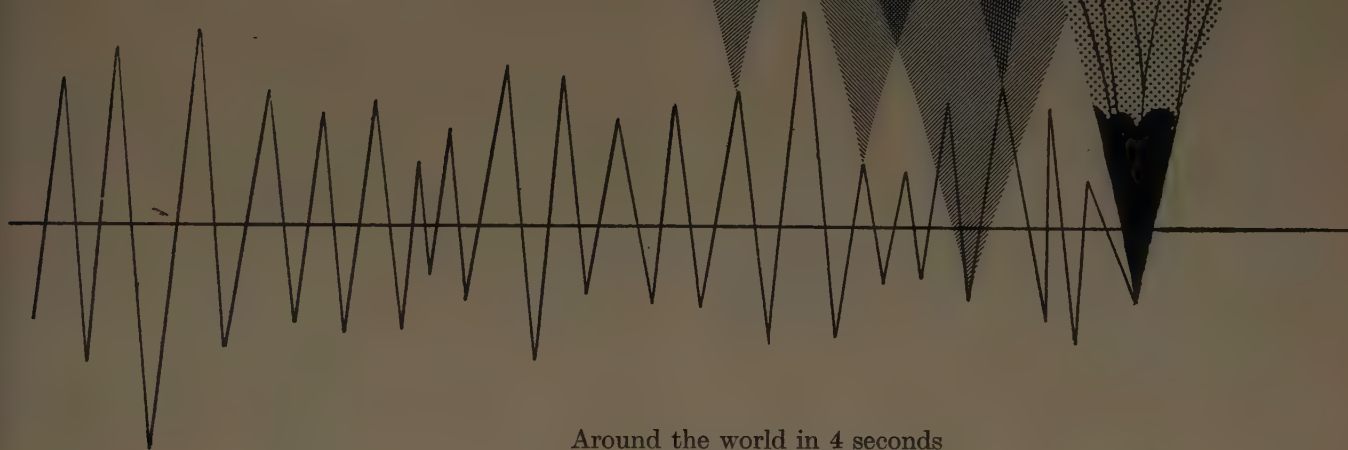
ACCESSORIES: Probe Model 1077. Camera Model 1458.

Full details of plug-in units will be supplied on application.



COSSOR INSTRUMENTS LIMITED, COSSOR HOUSE,

HIGH WRITING *SPEED*



Around the world in 4 seconds—or 1500 years—these extremes of velocity are attainable by the recording spot of the Cossoroscope Model 1076. This high writing speed is one of the many advantages which has earned it acclaim as the most advanced oscilloscope available commercially. The 1076 is yet another significant contribution to research and industry made possible by the imagination and experience of Cossor developmental laboratories.

Cossor manufacture the most extensive range of measuring oscilloscopes available commercially.

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INSTRUMENTS LIMITED

HIGHBURY GROVE, LONDON, N.5, ENGLAND, TELEPHONE: CANONBURY 1234

Code	Rated P.I.V.* Volts	Maximum Rectified Forward Current		Max. Peak Surge Current (sinusoidal) 10mS at Working Temp. Amps.	Typical Forward Volt Drop over Conducting Period Volts.
70U SERIES 70 TO 250 AMP.					
		Convection Cooled Amps.	Fan Cooled at 1000 L.F.M. Amps.		
70U5	50	110	220	2000	1.05
70U10	100	110	220	2000	1.05
70U20	200	110	220	2000	1.05
70U40	400	110	220	2000	1.05
70U60	600	110	220	2000	1.05
70U80	800	110	220	2000	1.05
RATING NOTES: *Maximum peak voltage which must cater for peak of crest plus any transients in the system. †Single phase halfwave rating, mounted on 7" x 7" by 0.160" thick fin, at 30° C Ambient					
45L SERIES 45 TO 150 AMP.					
45L5	50	58	130	1500	1.05
45L10	100	58	130	1500	1.05
45L20	200	58	130	1500	1.05
45L40	400	58	130	1500	1.05
45L60	600	58	130	1500	1.05
45L80	800	58	130	1500	1.05
45L100	1000	58	130	1500	1.05
RATING NOTES: *Maximum peak voltage which must cater for peak of crest plus any transients in the system. †Single phase halfwave rating, mounted on 7" x 7" by 0.160" thick fin, at 30° C Ambient					
25H SERIES 25 TO 45 AMP.					
25H5	50	20	55	400	1.05
25H10	100	20	55	400	1.05
25H20	200	20	55	400	1.05
25H40	400	20	55	400	1.05
25H60	600	20	55	400	1.05
RATING NOTES: *Maximum peak voltage which must cater for peak of crest plus any transients in the system. †Single phase halfwave rating, mounted on 3" x 3" by 1/8" thick fin, at 30° C Ambient					



70U
SERIES



45L
SERIES



25H
SERIES

HIGH POWER 25 to 250 amps

Code	Rated P.I.V.* Volts	Maximum Rectified Forward Current		Max. Peak Surge Current (sinusoidal) 10ms at Working Temp. Amps.	Typical Forward Volt Drop over Conducting Period Volts.
25HB SERIES 25 TO 35 AMP.					
		Convection Cooled Amps.	Fan cooled at 1000 L.F.M. Amps.		
25HB5	50	20	53	300	1.05
25HB10	100	20	53	300	1.05
25HB20	200	20	53	300	1.05
25HB40	400	20	53	300	1.05
25HB60	600	20	53	300	1.05
25HB80	800	20	53	300	1.05
RATING NOTES: *Maximum peak voltage which must cater for peak of crest plus any transients in the system. †Single phase halfwave rating mounted on 3" x 3" by 1/8" thick fin, at 30°C Ambient.					



25HB
SERIES

INTERNATIONAL RECTIFIER COMPANY

(GREAT BRITAIN) LIMITED · OXTED · SURREY · Oxted 3215

Associate company of International Rectifier Corporation U.S.A.
and the Metal Industries Group, Great Britain.



SILICON DIODES

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1956

19914. Forster, J.—Automatic delay action device. 27th September, 1957. (878641.)

22714. Cambridge Instrument Co., Ltd., and Beck, H. V.—Electrical measuring, indicating or recording apparatus. 23rd October, 1957. (878670.)

30748. H.N. Electrical Supplies, Ltd.—Position plotting apparatus for use with radar or other positional information systems. 12th November, 1957. (878901.)

31087. Jensen, H. B. F.—Control apparatus. 9th October, 1957. (878902.)

33758. Plessey Co., Ltd.—Processes for the manufacture of semiconductor materials. 5th November, 1957. (878765.)

38316. Solus Electronic Tubes, Ltd.—Supply circuits for electric precipitators. 17th March, 1958. (878672.)

1957

1575. Electric & Musical Industries, Ltd.—Pulse generating circuit arrangements. 15th January, 1958. (878937.)

8184. Rolls-Royce, Ltd.—Nuclear reactors. 11th March, 1958. (878872.)

19906. United Kingdom Atomic Energy Authority.—Support means for nuclear reactors. 17th June, 1958. (878940.)

27180. Jones, Tate & Co., Ltd.—Electrically operated soot blowers. 28th February, 1958. (878770.)

31580. Philips Electrical Industries, Ltd.—Devices for measuring very low voltages. 9th October, 1957. (878674.)

33597. Sangamo Weston, Ltd. (Weston Electrical Instrument Corporation).—Electromechanical transducer systems. 28th October, 1957. (878945.)

36198. Associated Electrical Industries, Ltd.—Semiconductor devices. 14th November, 1958. (878920.)

1958

175. Electrolux, Ltd.—Coupling devices for vacuum cleaners. 2nd January, 1958. (878554.)

330. Standard Telephones & Cables, Ltd.—Transistor oscillators. 3rd January, 1958. (Addition to 777099.) (879146.)

346. Austin Motor Co., Ltd., and Hivac, Ltd.—Electrical signalling circuits suitable for the automatic control of machining operations. 1st January, 1959. (878874.)

645. Asakawa, G., and Vernet, S.—Converter of electrical energy into mechanical movement. 7th January, 1958. (878832.)

668. General Cable Corporation.—Protective coverings for metal sheathed electric cables. 7th January, 1958. (878860.)

3962. I-T-E Circuit Breaker Co.—Circuit protective devices. 6th February, 1958. (878826.)

7882. Siemens-Schuckertwerke A.G.—Synchronous dynamo-electric machines. 11th March, 1958. (878829.)

7935. Soc. Générale de Constructions Electriques et Mécaniques Alsthom.—Gas-blast circuit-breakers. 12th March, 1958. (878658.)

12229. Vedovelli, M.—Process for manufacturing microporous diaphragms for electrical accumulators. 17th April, 1958. (878639.)

18669. Heraeus G.m.b.H., W. C.—Electric arc furnaces. 11th June, 1958. (878939.)

25075. International Business Machines Corporation.—Transistor regulator circuits. 11th August, 1958. (878990.)

28177. Boyd, Ltd., Winnett.—Nuclear reactors. 13th July, 1959. (879183.)

28178. Nuclear steam generators. 29th July, 1959. (879184.)

29030. General Electric Co., Ltd.—Production of magnetic core laminations. 8th September, 1959. (878573.)

29859. General Electric Co., Ltd.—Electrical distribution boxes. 6th August, 1959. (878611.)

31216. Siemens & Halske A.G.—Arrangements for determining the free or busy state of a line in a telecommunication system. 30th September, 1958. (879174.)

31416. C.A.V., Ltd.—Electricity distributing systems and protective arrangements therefor. 30th September, 1959. (878954.)

32387. General Electric Co.—Nuclear fuel. 10th October, 1958. (878911.)

35186. Westinghouse Brake & Signal Co., Ltd.—Inverter circuits using transistors. 14th October, 1959. (878612.)

35383. Wheatcroft & Co., Ltd., George H.—Tapes embodying electric threads. 3rd November, 1959. (878893.)

37155. Alethea Electric, Ltd.—Electromechanical disc brakes for electric motors. 17th February, 1960. (878613.)

38011. Marconi's Wireless Telegraph Co., Ltd.—Protective circuit arrangements. 24th August, 1959. (878922.)

38126. Telephone Cables, Ltd.—Automatic indicators for electrical bridge networks. 26th November, 1959. (878921.)

38617. Rotax, Ltd.—Means for protecting three-phase electric systems. 25th November, 1959. (878924.)

39307. Standard Telephones & Cables, Ltd.—Frequency detecting and correcting systems. 5th December, 1958. (878878.)

39537. Carr Fastener Co., Ltd.—Electrical convactor caps for electrical valves. 3rd November, 1959. (879039.)

40359. Globe-Union, Inc.—Electrical switch and variable resistor for miniature electrical apparatus. 15th December, 1958. (878614.)

40873. General Motors, Ltd.—Centrifugal clothes dryer. 18th November, 1959. (879082.)

1959

2550. Wissenschaftlich-Technisches Büro für Gerätebau Veb.—Relay circuits. 23rd January, 1959. (878159.)

6538. Babcock & Wilcox, Ltd.—Tubulous vapour generators and steam generating systems incorporating water cooled nuclear reactors. 11th February, 1960. (878232.)

8025. Telephone Manufacturing Co., Ltd.—Manufacture of impregnated electrical components. 9th March, 1960. (878108.)

12874. Sylvania Electric Products, Inc.—Mechanism for orientating electrical components. 15th April, 1959. (878306.)

13121. Allmänna Svenska Elektriska A.B.—System for telemetering a plurality of values of variable magnitude over a single transmission line. 17th April, 1959. (878475.)

18978. Siemens & Halske A.G.—Communication cables. 3rd June, 1959. (878062.)

22234. Wittlake, K. H.—Variable resistance device. 29th June, 1959. (878476.)

24065. Maschinenfabrik Oerlikon.—Arc chamber for air-break circuit-breakers. 13th July, 1959. (878394.)

25573. Accumulatoren-Fabrik A.G.—Method of producing negative electrodes for alkaline storage batteries. 24th July, 1959. (878253.)

26145. Fielden Electronics, Ltd.—Proximity switches. 14th July, 1960. (878372.)

27070. United States Atomic Energy Commission.—Nuclear reactor control. 7th August, 1959. (878332.)

27797. Automatic Telephone & Electric Co., Ltd.—Mounting of electric devices. 14th July, 1960. (878446.)

31499. International Business Machines Corporation.—Superconductive switching devices. 15th September, 1959. (878377.)

33483. Creed & Co., Ltd.—Electrostatic coupling. 2nd October, 1959. (878165.)

34671. Mullard, Ltd.—Cold cathode stepping tubes. 13th October, 1959. (Addition to 875484.) (878260.)

34759. National Industri A.S., and Lange, E.—Electrical fuses. 14th October, 1959. (878203.)

35166. Servo Corporation of America.—Electrical switching devices. 16th October, 1959. (878261.)

36751. Texas Instruments, Inc.—Temperature compensated grown junction transistor. 29th October, 1959. (878263.)

42261. Welwyn Electric, Ltd.—Potentiometers. 11th December, 1959. (878116.)

Trade Mark Applications

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 4th November.

Smiths. No. 804,928. Class 9. Automatically operated timing and switching mechanisms.—S. Smith & Sons (England), Ltd., Cricklewood Works, Edgware Road, London, N.W.2.

Caravelle. No. 807,414. Class 9. Domestic vacuum cleaners incorporating brushes, and rotary shoe brushes, all operated by electric torch batteries.—S. D. Rand, Ltd., 29, Beak Street, Regent Street, London, W.1.

Three Star (design). No. 818,388. Class 9. Temperature indicators, automatic temperature regulators, thermostats, measuring apparatus and instruments, and electrical apparatus and instruments.—Tyler & Co., Ltd., Perram Works, Merrow, Guildford, Surrey.

Pye. No. 817,037. Class 10. Electrically heated pads and blankets, electrical apparatus

for use in medicine, etc.—Pye, Ltd., Radio Works, St. Andrews Road, Cambridge.

Dirigent. No. 814,011. Class 11. Electro-technical illuminating, heating, cooking, cooling and drying apparatus and installations.—Standard Telefon und Telegraphen Akt.-Ges., Czeija, Nissl & Co., Vienna. Address for service: E. B. Robinson, Therese House, 29-30, Glasshouse Yard, Aldersgate Street, London, E.C.1.

Denloy. No. B818,531. Class 11. Lighting installations and fittings.—Cord-Wallis Non-Ferrous Metals, Ltd., Denmark Street, Maidenhead, Berks.

Eltrofin. No. 820,136. Class 11. Electric heating elements fitted with fins or gills.—Eltron (London), Ltd., 2, Strathmore Road, Croydon, Surrey.

Raysig. No. 822,246. Class 11. Electric heating apparatus embodying glass-embedded heating elements; and hotplates and plate-warmers.—Railway Signal Co., Ltd., 96, York Way, King's Cross, London, N.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Allestree.—Parish Council. 1st November. Trunk road lighting. (See Classified Advertisement Section.)

Australia.—Commissioner for Railways, Brisbane. 21st November. Twelve diesel-electric Co-Co locomotives. (E.S.B. 31523/61.)*

Bristol.—Corporation. 17th November. Fire alarm system in home for elderly persons. (See Classified Advertisement Section.)

Burma.—Purchase Board, Rangoon. 2nd November. Electric lighting fittings. (E.S.B. 32220/61.)*

Canada.—Saskatchewan Power Corporation. 15th November. 350 kW generating set. (E.S.B. 31643/61.)*

Winnipeg Hydro-Electric System. 31st October. Fourteen 69 kV and fourteen 7.5 kV disconnecting switches. (E.S.B. 31919/61.)*

France.—Signal Division, S.H.A.P.E., Paris. 8th November. Radio equipment. (E.S.B. 31646/61.)*

India.—Koyna Project (Electrical), Bombay. 19th December. Four 86,000 kVA hydro-electric generators. (See Classified Advertisement Section.)

National Coal Development Corporation. 25th November. Twelve diesel generating sets. (E.S.B. 31902/61.)*

Madhya Pradesh Electricity Board. 27th November. Construction work for power house. (E.S.B. 31909/61.)*

Andhra Pradesh State Electricity Board. 8th November. Distribution transformers. (E.S.B. 32251/61.)* 9th November. 95,000 electricity meters. (E.S.B. 32252/61.)* 20th November. 13,000 electricity meters. (E.S.B. 32254/61.)*

Punjab State Electricity Board. 10th November. Telephone equipment. (E.S.B. 32257/61.)* 15th November. Metering equipment. (E.S.B. 32258/61.)*

Iraq.—Ministry of Defence. 22nd November. Two 250 kW generators. (E.S.B. 31964/61.)*

Kenya.—Nairobi City Council. 6th November. Cable. (E.S.B. 31926/61.)*

Pakistan.—Water and Power Development Authority, Lahore. 30th October. Circuit-breakers. (E.S.B. 31697-8/61.)* 16th November. Pumps, motors, transformers, etc. (E.S.B. 31628/61.)*

Posts and Telegraphs Directorate General, Karachi. 9th November. Loading coils and capacitors. (E.S.B. 31699/61.)*

Peru.—Lima Light & Power Co. 31st January, 1962. 220 kV oil-filled cable. Details from Motor-Columbus, Ltd., Parkstrasse 27, Baden, Switzerland. (E.S.B. 31088/61.)*

Peterborough.—R.D.C. 14th November. Dale mobile alternator unit. (See Classified Advertisement Section.)

Rhodesia and Nyasaland.—Salisbury Electricity Department. 7th November. Radio-telephone equipment. (E.S.B. 31930/61.)*

Sedburgh.—R.D.C. 8th November. Television system. (See Classified Advertisement Section.)

Taunton.—Borough Council. 28th October. Supply of electrical goods (Schedule d) for one year commencing 1st January, 1962. K. A. Horne, Town Clerk, Municipal Build-

ings. 31st October. 83 electric sink water heaters, Lambrook, Lyngford and Wedlands estates. H. G. Cox, housing maintenance superintendent, Lambrook Farm Depot, Priory Avenue, Taunton.

Turkey.—N.A.T.O. Infrastructure Contract. Standby power units. Applications to tender by 30th October. (G.D. 88/61(36).)†

ORDERS PLACED

Durham.—County Education Committee. The following tenders for electrical work have been accepted: Hare Law Day School (£2,427), and Felling Leam Lane Community and Youth Centre (£1,295).—Gray Brothers. Cleadon County Junior School (£2,211), and Ryhope Robert Richardson Grammar School (£9,106).—Cook & Dawson. Newton Aycliffe Maternity and Child Welfare Centre and Library (£2,007).—Cox-Walkers. West Pelton Modern School (£6,756).—C. Horne & Co.

London.—L.C.C. Electrical installations in Block 46, Brandon estate, Southwark (£2,837).—Electric Contracts (London). Supply and installation of electric water heaters in 453 dwellings, Downham estate, Lewisham (£24,595).—F. J. Baynes & Co. Renewal and improvement of electrical installation at Eltham Hill School, Woolwich (£6,909).—A. G. Purdy & Sons. Electrical installations in dwellings, Ethelburga Street site, Battersea (£2,871).—J. & W. Mayer. Three passenger lifts, Northampton College of Advanced Technology, Finsbury (£28,702).—Express Lift Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Barnstaple.—Motel, restaurant and ballroom, Saunton Road, Braunton; Harris & Son (Braunton), Ltd., East Street, Braunton.

Bath.—Rebuilding Royal National Hospital for Rheumatic Diseases, for South Western Regional Hospital Board; Gerrard, Taylor & Partners, architects, Bridge Street, Bath.

Bedford.—Divisional police headquarters (£226,000); S. Goodman, county architect, Shire Hall, Bedford.

Billingham-on-Tees.—Proposed sports stadium (£745,000); U.D.C. surveyor.

Bootle.—Reconstruction of Town Hall and enlargement of Council Chamber; borough engineer, Town Hall.

Bradford.—Administrative offices at The Park site (£35,000); W. Clifford Brown, city architect.

Brighton.—Home for the blind, handicapped and infirm, Heath Hill Avenue, Bevendean; D. J. Howe, borough engineer, 26/30, King's Road.

Bromley.—Houses and flats (100), Burnt Ash Lane; borough engineer, Municipal Offices.

Brownhills (Staffs.).—Factory, Coppice Road, Walsall Wood; Brownhills Sheet Metal Co., Ltd., Camden Works.

Cheltenham.—Printing works, Chapel Street; C. J. Young, Ltd., 8-9, Ambrose Street.

Chesterfield.—Houses (800) and shops, Loundsley Green estate; borough surveyor.

Four-storey shop and office block in New Square (£90,000); New Square Properties, Ltd., Chesterfield.

Congleton.—Works extensions; Berisfords, Ltd., Victoria Mill.

Crewe.—Public library (£120,000) and reinstatement of Corn Exchange; borough engineer, Municipal Buildings.

Croydon.—Rebuilding Coloma Grammar School and Convent, Shirley Court estate (£216,000); borough engineer, Town Hall.

Dewsbury.—Bus station and garage; Yorkshire Woollen District Transport Co., Ltd., Savile Town.

Doncaster.—Offices, Hallgate; Abbey National Building Society, Abbey House, Baker Street, N.W.1.

Dublin.—Plastic packaging factory (£300,000); Metal Box Co., Ltd., 44, Baker Street, W.1.

Dukinfield.—Homeville dwellings (200); Yew Tree Lane estate; housing manager, Town Hall, Dukinfield, Cheshire.

Edinburgh.—Secondary school, Duddingston Road, Portobello; Fairbrother, Hall & Hedges, architects, 27, Rutland Square, Edinburgh.

Hereford.—Works extensions; Denco Engineering Services, Ltd., Holmer Road.

Hexham.—Shops, Priestlands estate; U.D.C. surveyor.

Hinckley.—Council offices (£208,000); U.D.C. surveyor, Station Road Offices.

Horsham.—New church of St. John with hall, Broadbridge Heath; J. E. Ralph, architect, 1, Gower Street, London, W.C.1.

Inverness.—Additions and alterations to store premises, High Street/Lombard Street (£135,000); chief architect, F. W. Woolworth & Co., Ltd., Woolworth House, Marylebone Road, London, N.W.11.

London.—Houses (164), Haddo Street, Greenwich; borough engineer, Town Hall, S.E.10.

Extension (£380,000), Westbere Road School, Hampstead; Stillman & Eastwick-Field, architects, 30, John Street, W.C.1.

Showrooms and offices, The Hyde, Hendon; Guise, Davies & Upfold, architects, 132, Sloane Street, S.W.1.

Maidenhead.—Parish church; Seely & Paget, architects, 41, Cloth Fair, E.C.1.

Merthyr Tydfil.—Sixty shops, flats and offices; Chesterfield Properties, Ltd., 8, Chesterfield Street, W.1.

Midlothian.—Seventeen factories, Loanhead; county architect, 32, Palmerston Place, Edinburgh.

Newport (Mon.).—Three-storey home, Hendre Farm Drive, Rینگland estate (£105,600); borough surveyor, Civic Centre.

Northern Ireland.—Proposed swimming pool, Armagh; Munce & Kennedy, architects, University Street, Belfast.

Houses on 75-acre site, Belfast; Northern Ireland Housing Trust, 12, Hope Street, Belfast.

Houses (250), Killyleagh and Ballynahinch; R.D.C. architect, Downpatrick, Co. Down.

Oxford.—Motel, northern by-pass site (£150,000); Watney-Lyon Motels, Ltd., 14, Fitzhardinge Street, London, W.1.

Preston.—Houses (141), Ingol; borough engineer, Municipal Buildings.

Rochester.—Houses (68), Earl estate, and houses (39), flats (16) and two shops, Warren Wood redevelopment; James A. Peel, city surveyor, 66, Maidstone Road.

Salisbury.—Dwellings (77), Essex Square, West Harnham; city engineer.

Scunthorpe.—Houses and flats (1,000), during 1962-63; borough surveyor.

Whickham (Co. Durham).—Swimming baths, Dunston; Fennell & Baddiley, U.D.C. architects, Bridge End Chambers, Chester-le-Street.

Worcester.—Shopping centre, Lich Street area; city engineer, 22, Bridge Street.

* This information is extracted from the Board of Trade Export Service Bulletin. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given. † Telephone: Trafalgar 8855, Ext. 2010.

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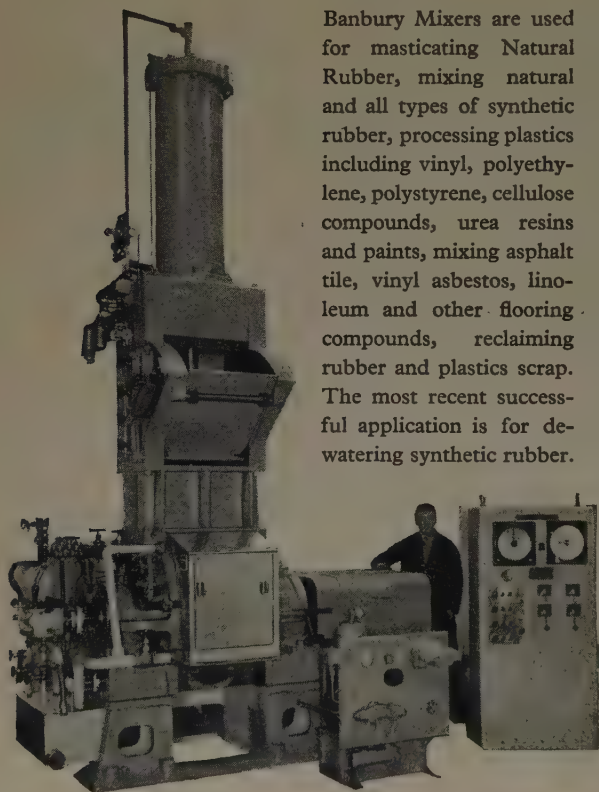


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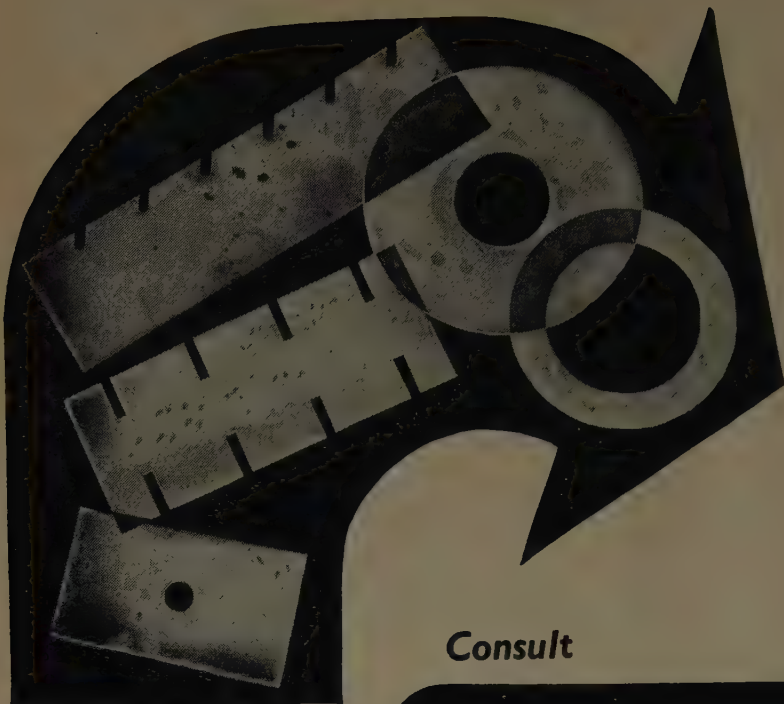
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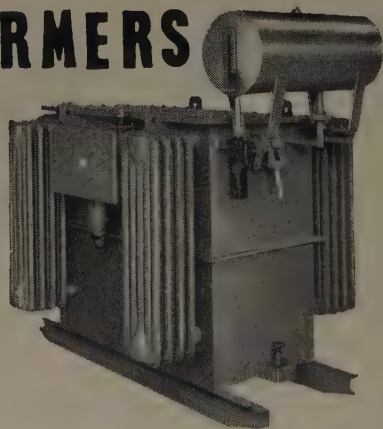
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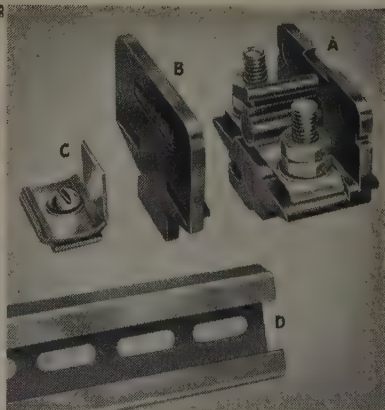
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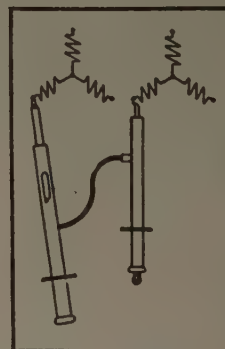
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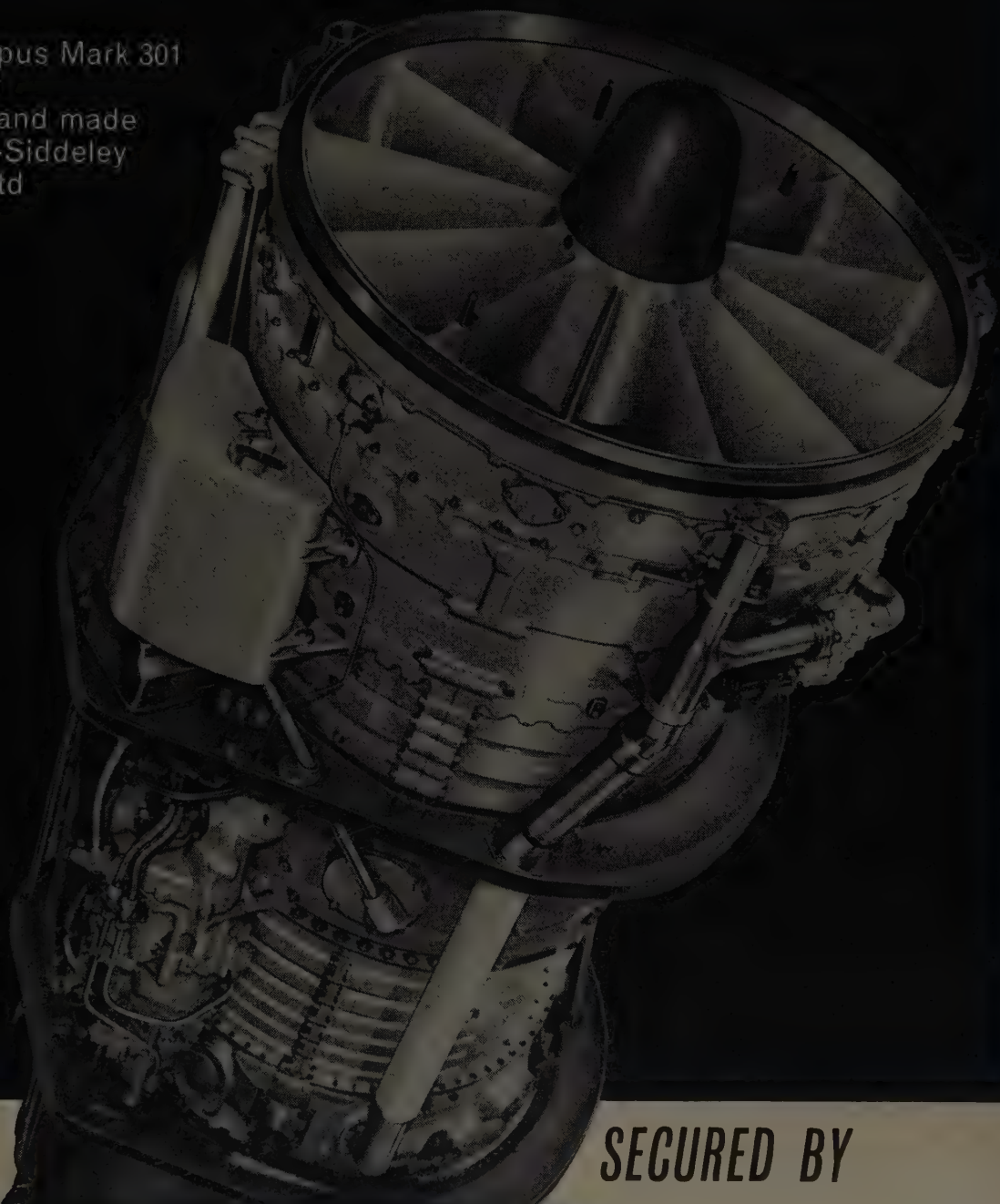
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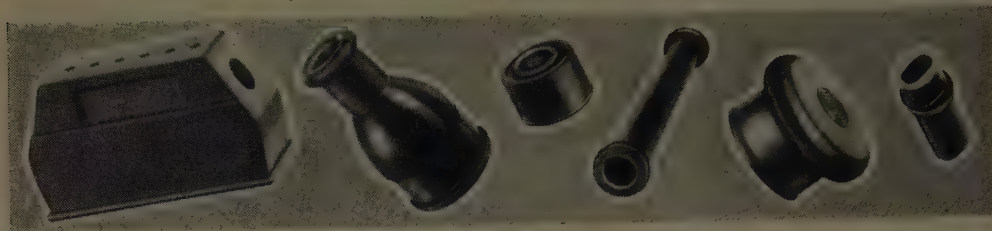
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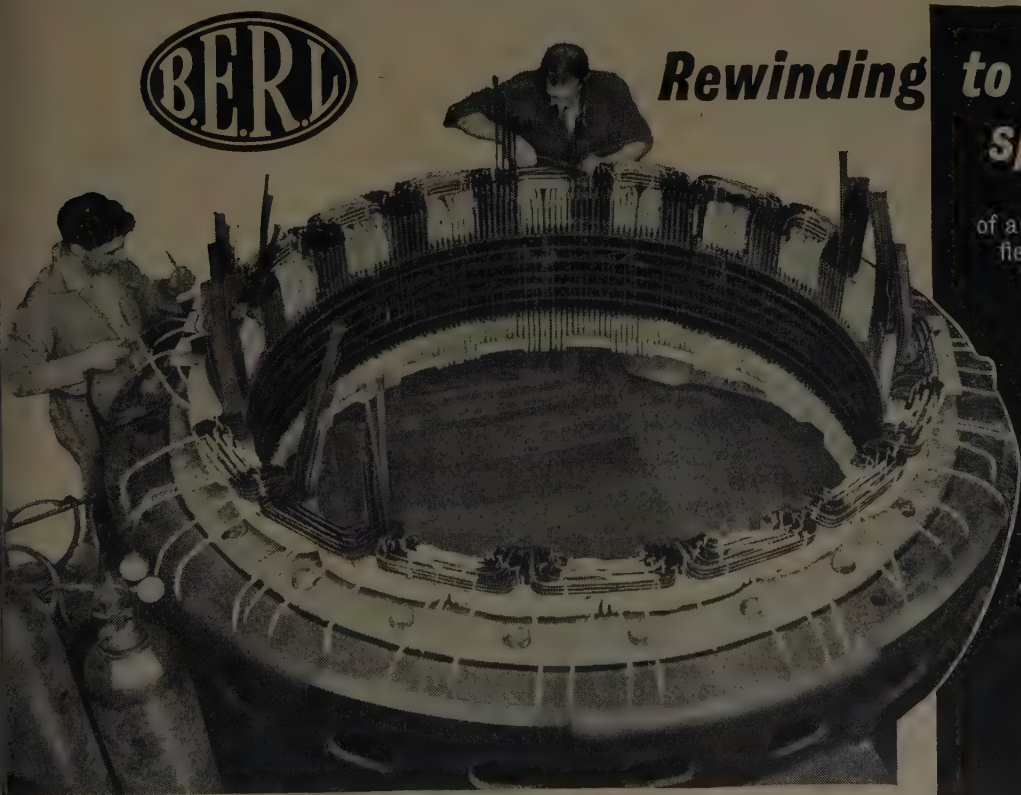


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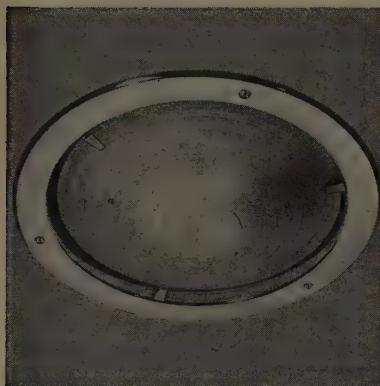
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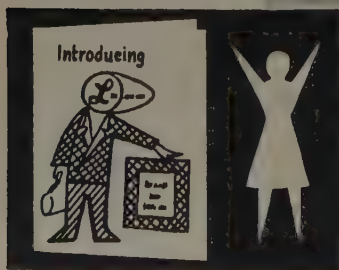


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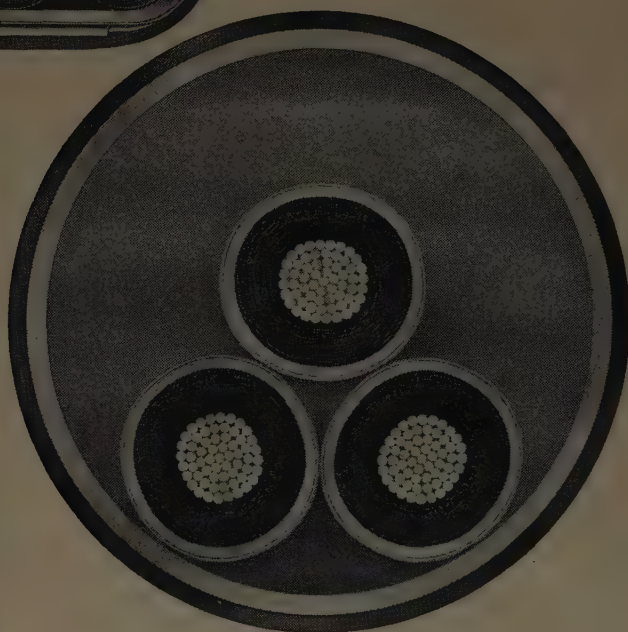


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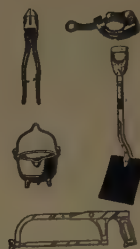
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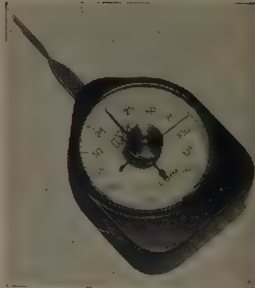
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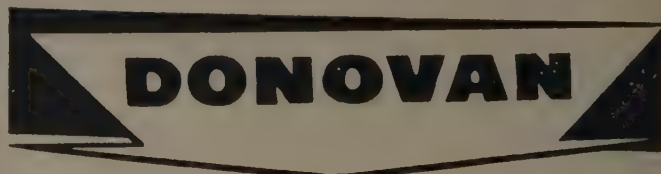
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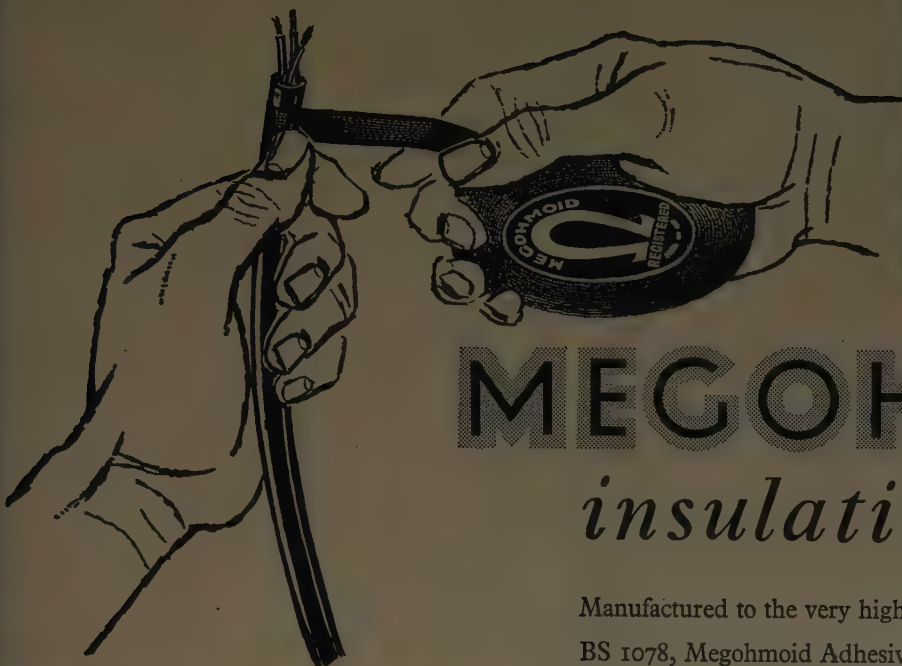
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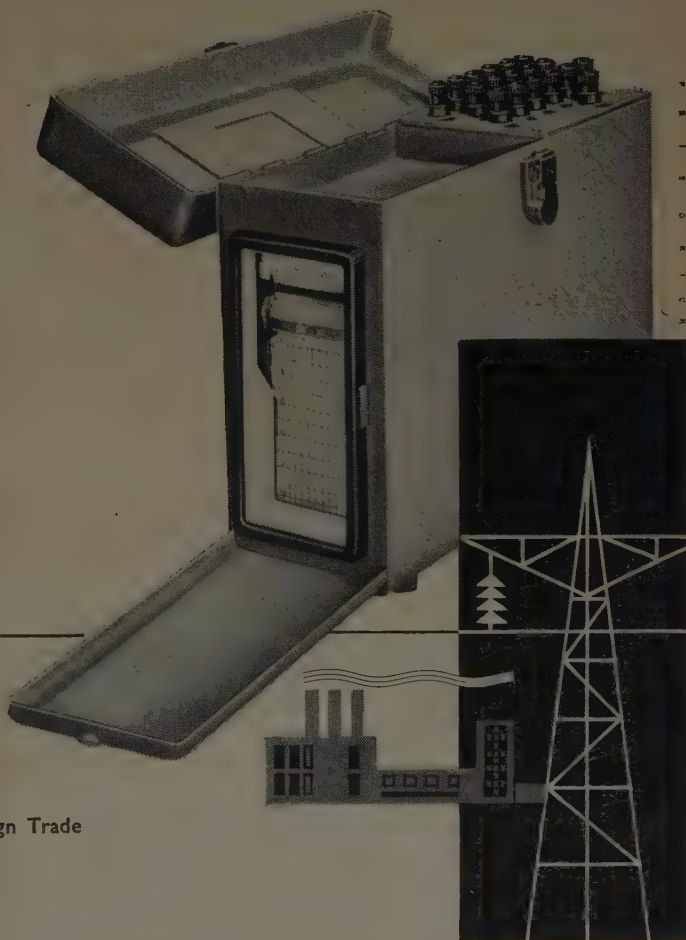
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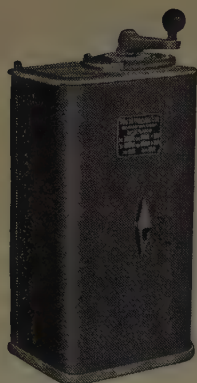
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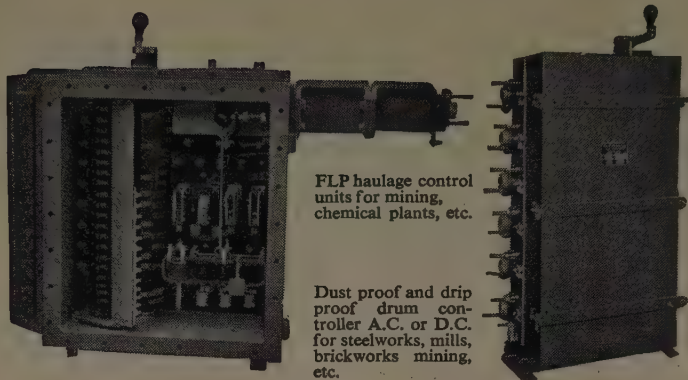
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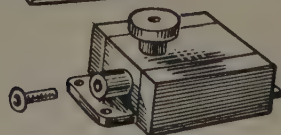
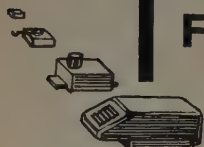
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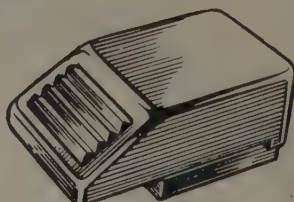
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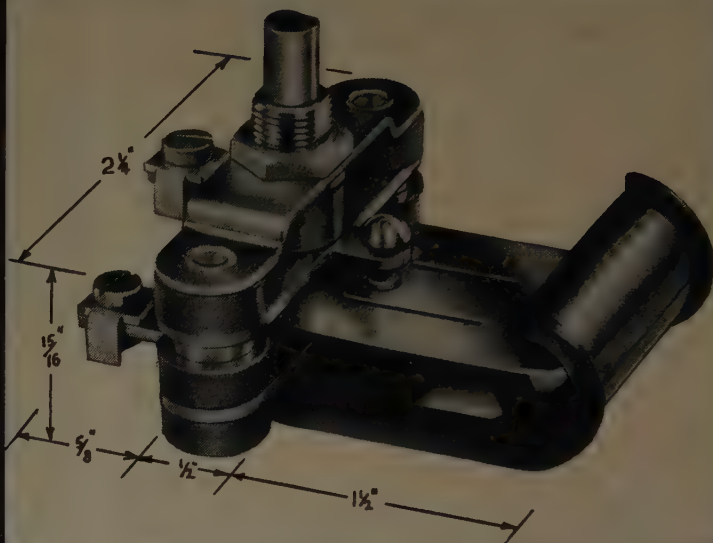
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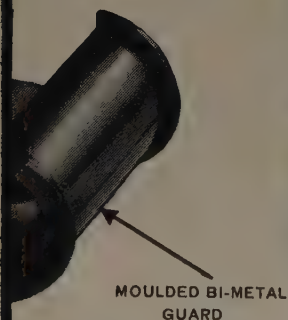
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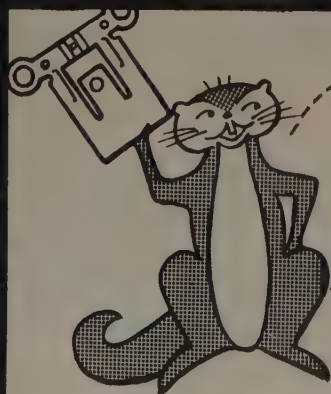
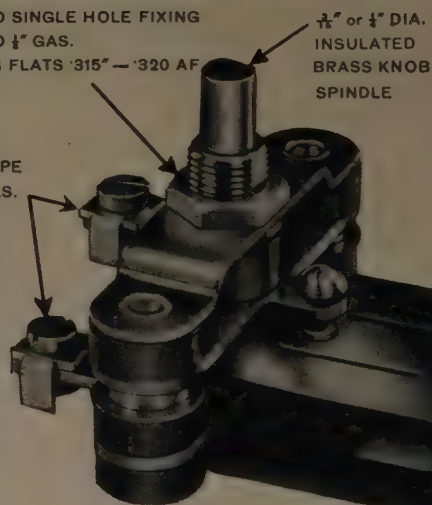


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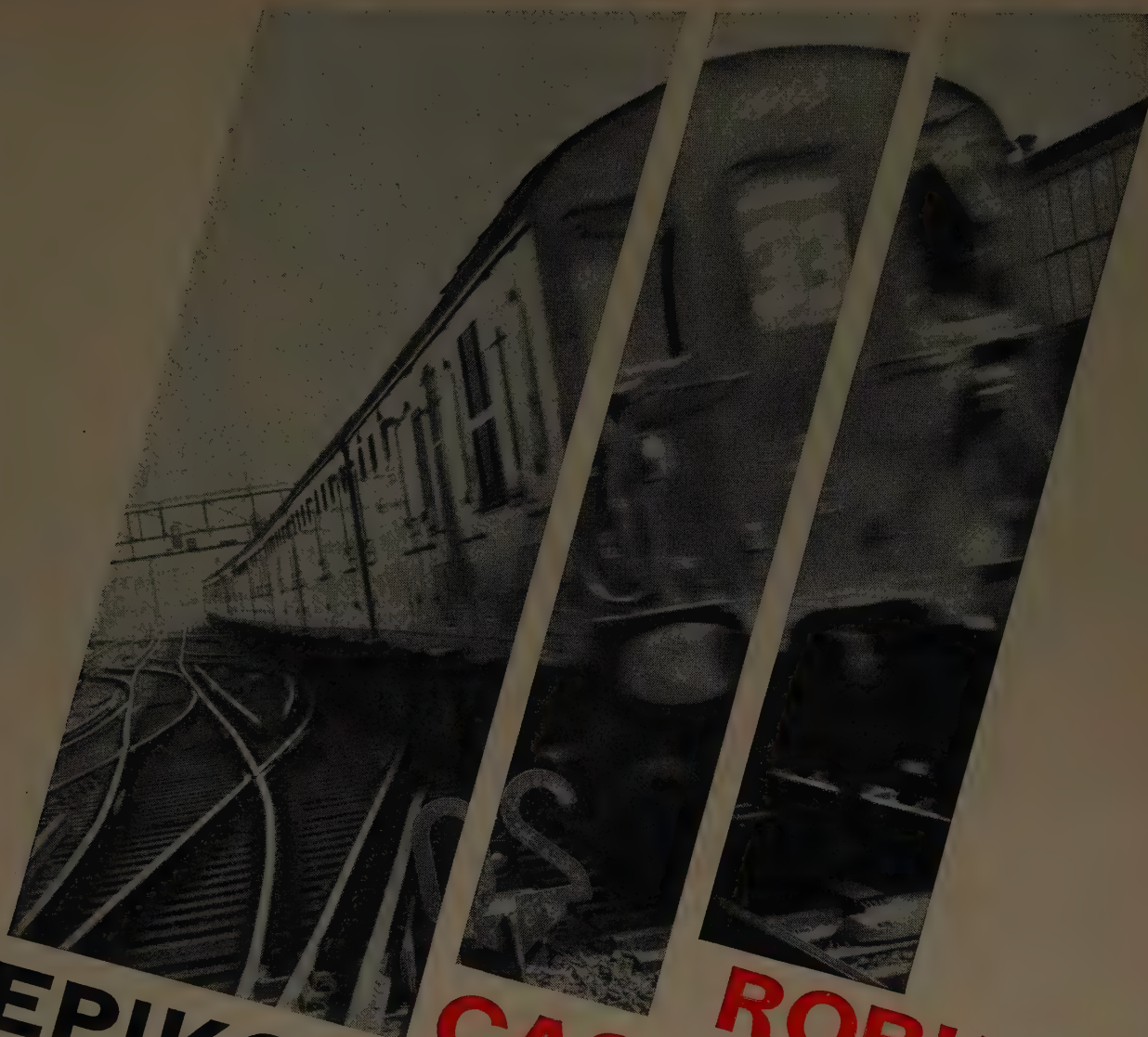
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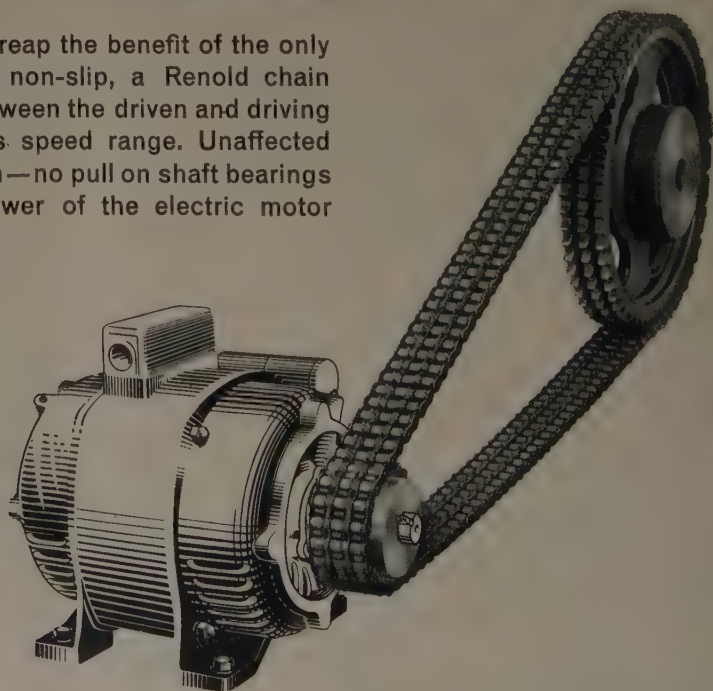


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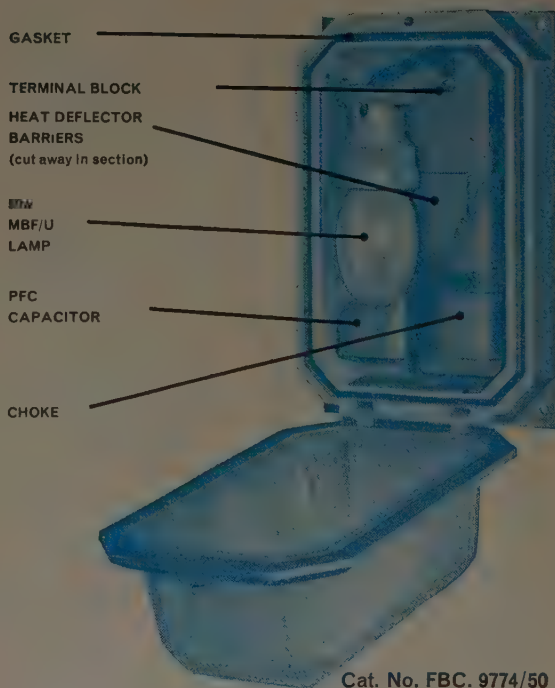
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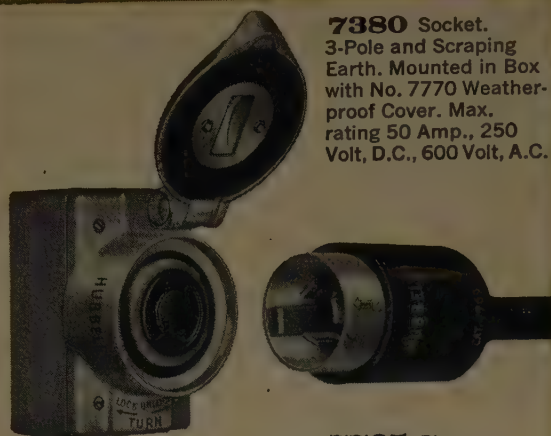
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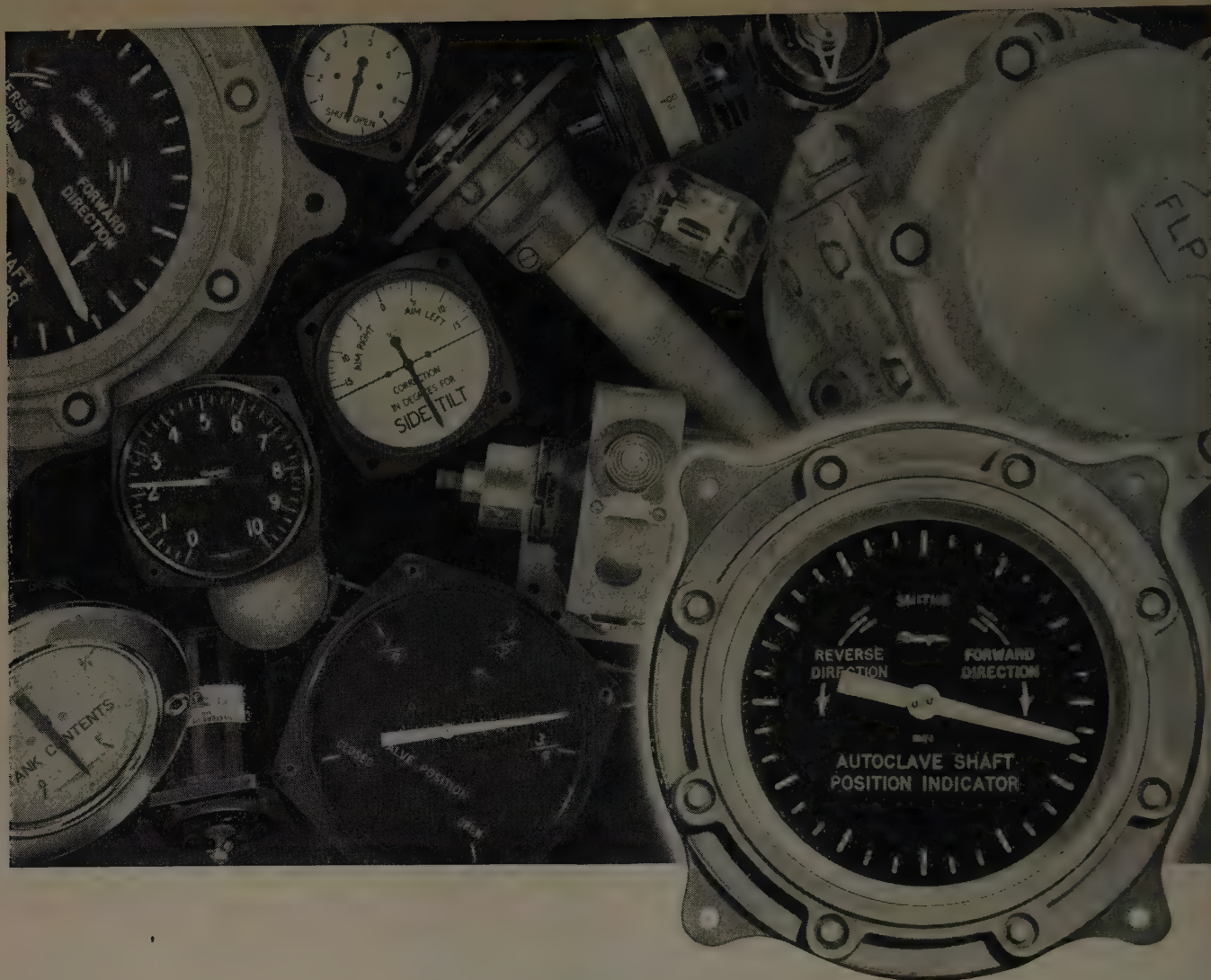
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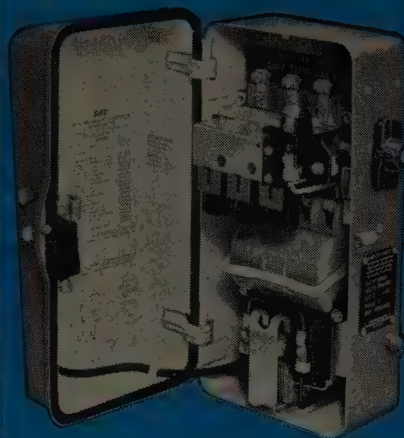
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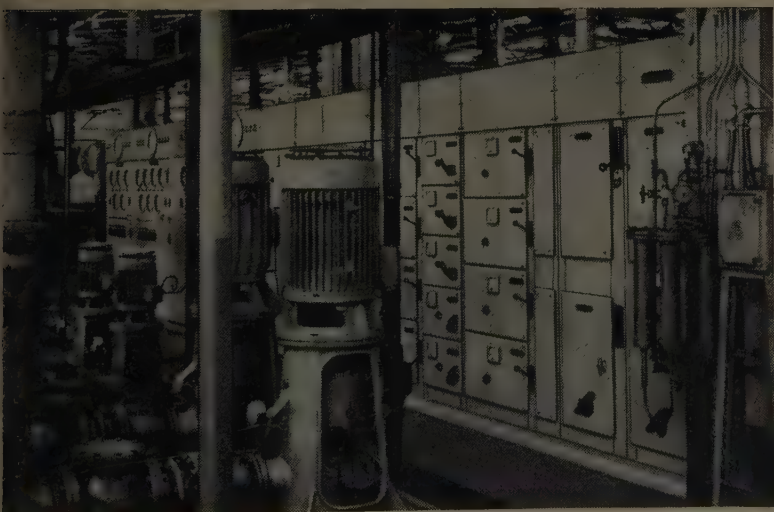
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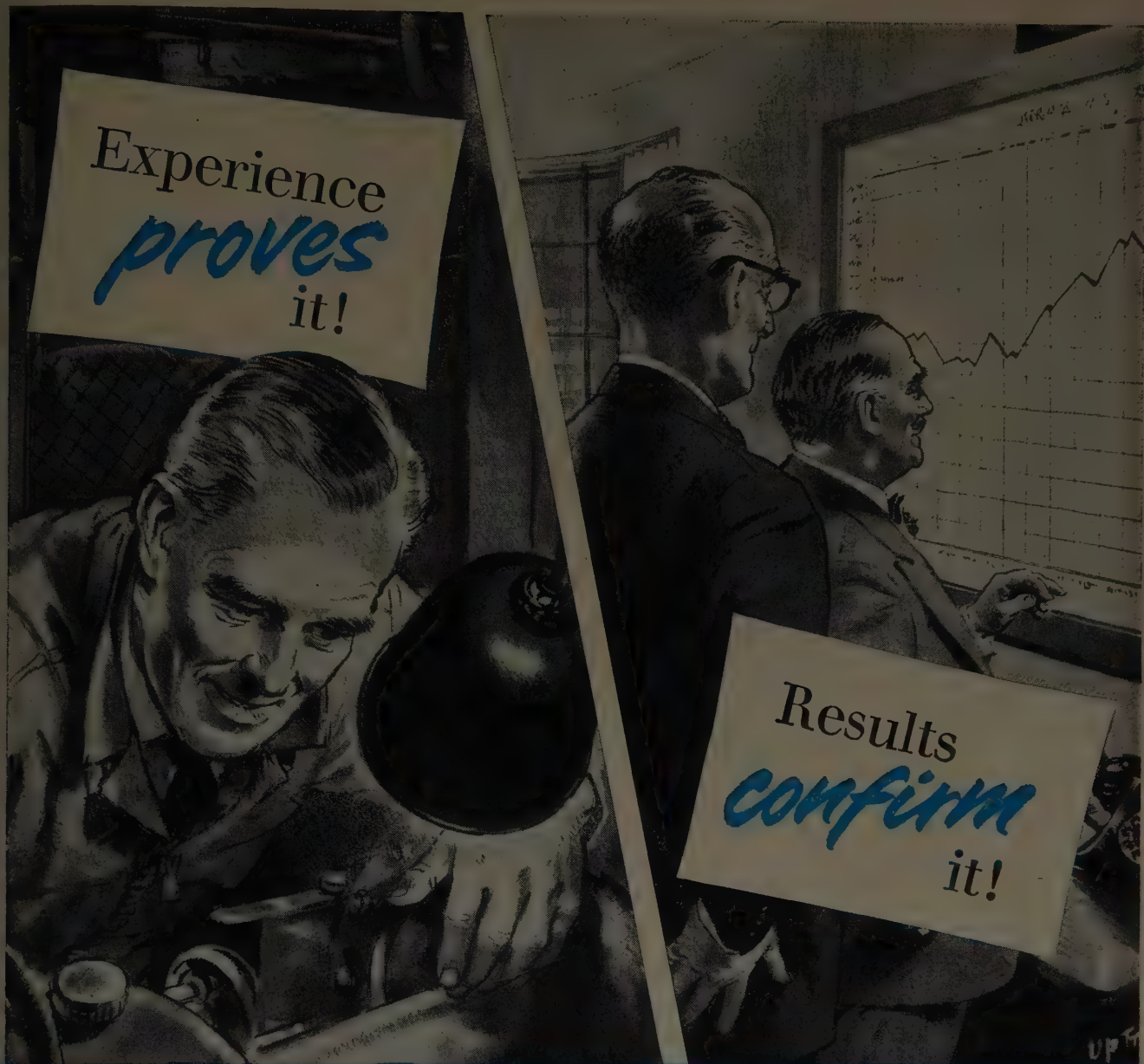
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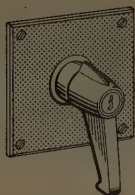


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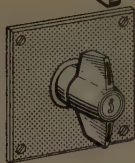
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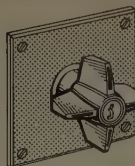
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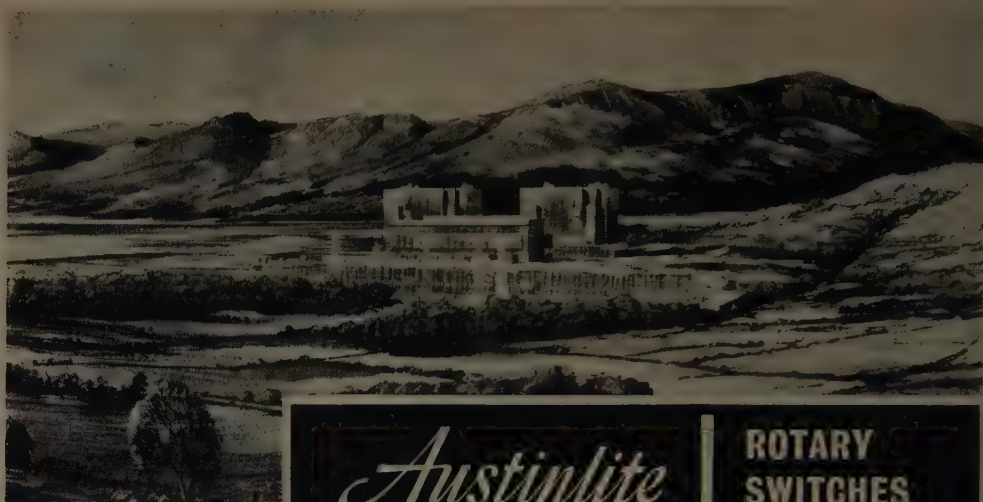
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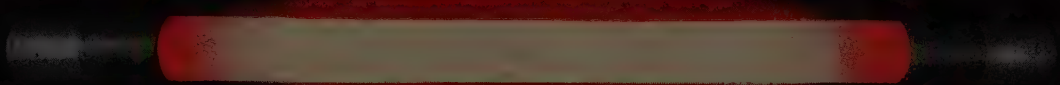
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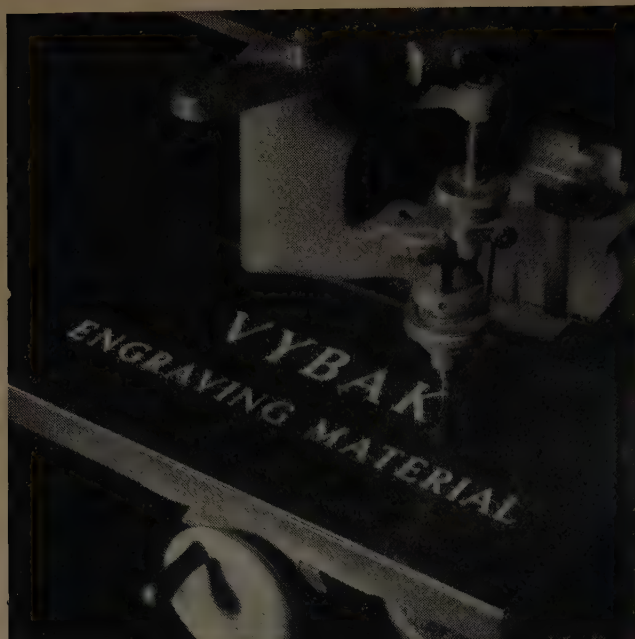
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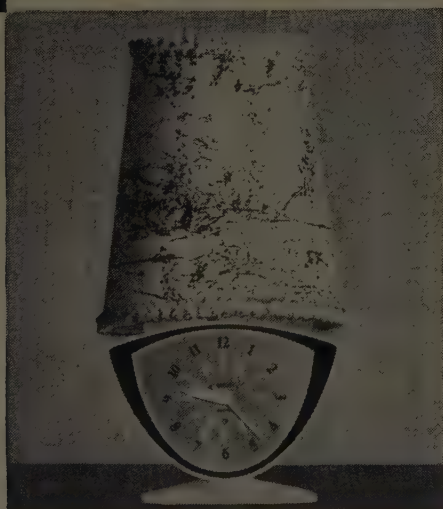
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This 'Sectric' Alarm in white case features a bold dial in white, black and gold. Spot luminous. £2.5.6.



call star

The white moulded case of this 'Sectric' alarm has a striking maroon or black border. Spot Luminous £2.5.6.



call alite

'Sectric' alarm with bedside lamp. Maroon or black dial with matching shades. £3.6.0.

They're on the way... these new and specially designed 'Sectric' alarms, embodying the very latest production techniques. Winners like the 'Page' and 'Pageboy'! Perfect gift lines! Certain to attract fresh sales wherever the call is for contemporary styles. Ask your wholesaler for details of new display stands for Sectric alarms available shortly.

SMITHS

'SECTRIC' ALARMS

SMITHS

CLOCK & WATCH DIVISION

Sectric House, London, N.W.2. Showrooms: 179 Great Portland Street, W.1.

• H.R.C. • Cartridge • Fuse Links



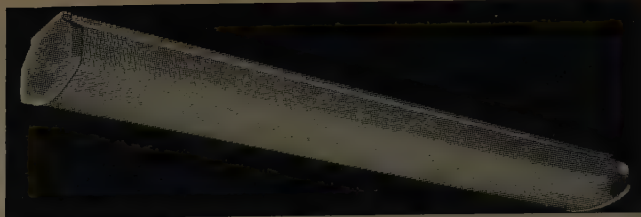
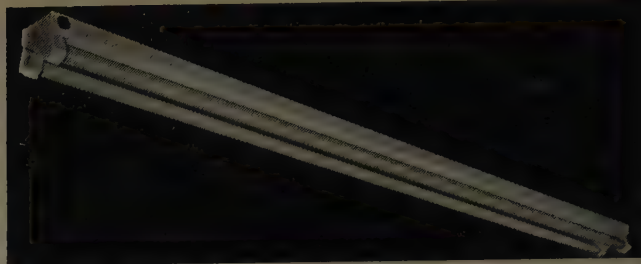
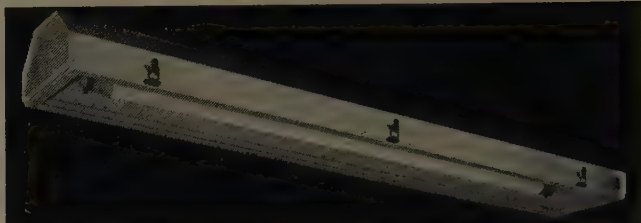
- B.S.88 CATEGORY OF DUTY, AC4
- A.S.T.A. TEST CERTIFICATE
Nos. 2050-2054
- Ratings up to 300 Amps, 440 Volts
- Illustrated Pamphlet and Price List from—

**L. WEEKES
(LUTON) LIMITED**

- WINGATE ROAD, LUTON, BEDS
- Telephone: LUTON 51478 Telegrams: "SAFETEE LUTON"

UTILAIR**BRITAIN'S BEST
FLUORESCENT LIGHTING
FITTINGS & CONTROL GEAR**Starter switch
type choke
incorporating
starter holder.Starter switch
type high
power factor
ballast unit.Choke with
instant start
transformer
unit.

Britain's best range
of Fluorescent Fit-
tings selected for
efficient lighting by
famous concerns
all over the world

**Model EP.802** Suspended or ceiling fitting with opal fluted diffusing cover**Model D.2125** Twin 8ft. 125 watt batten fitting**Model VP.802** Industrial vapour-proof totally enclosed fitting**UTILITIES (LONDON) LTD.**

Manufacturing Electrical Engineers

TUNSTALL ROAD • BRIXTON

LONDON • S.W.9

Telephone : Brixton 6811-4

Telegrams : Utilon, London, S.W.9

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INSULATING?

When you specify a paper you don't expect 'ifs' or 'buts'... you expect to get what you want. So make sure your papers come from Tullis Russell—and save your energy for sorting out any snags elsewhere! Tullis Russell papers range from those for fine-wire winding to body material for heavy bonded bushings. Please don't hesitate to call in our Technical Advisory service—even when your problem's a trifling one! We're *always* glad to be of service.

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150 YEARS OF FINE PAPERMAKING

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Griffin House, 18-19 Ludgate Hill

MANCHESTER:

372 Corn Exchange Buildings, Corporation St.

WPS-117

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 4/- per line (approx. 6 words).

DISPLAYED CLASSIFIED:—53/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Remittances payable to "ELECTRICAL REVIEW."

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

KOYNA HYDRO-ELECTRIC PROJECT

THE Offices of the Koyna Project (Electrical), Mercantile Bank Buildings, Mahatma Gandhi Road, Fort, Bombay, 1, India, invites tenders for the following:—

KOYNA HYDRO-ELECTRIC PROJECT, STAGE II.

TENDER ENQUIRY No. EL/G-II.

For the supply and installation of 4 300-r.p.m. Hydro-Electric Generators, each having a capacity of about 80,000 kVA (two alternatives) at 0.9 p.f., 11 kV, 3-phase, 50 cycles, with an excitation plant with voltage regulator and other accessories as described in the specification.

Specifications, drawings, etc., relative to the above tender enquiry can only be obtained from the Office of the Chief Engineer (Electrical), Koyna Hydro-Electric Project, Mercantile Bank Buildings, 4th Floor, Bombay, India, on payment of £5 12s. 6d. per set plus £1 4s. per set for packing and postage, if tender sets are required by registered air parcel.

Tenders are to be returned direct to the Chief Engineer (Electrical), Koyna Hydro-Electric Project, Mercantile Bank Buildings, Fort, Bombay, 1, India, AND NOT TO THIS OFFICE, so as to reach them by 19th December, 1961.

The Koyna Hydro-Electric Project reserves the right to reject any or all tenders without assigning any reason.

Only the manufacturers (including their constituents or associates authorised to commit them) or their accredited agents who are in a position to supply the requirements from their own or their principal's manufactures are invited to quote.

2668

MATLOCK URBAN DISTRICT COUNCIL

Street Lighting: Trunk Road A.6 from Masson Mills, Matlock Bath, to the 30 m.p.h. limit, Derby Road, Cromford

TENDERS are invited for the provision and erection of 28 Group A Lighting Units consisting of steel columns, 140-watt Sodium Discharge lamps and auxiliary equipment, etc., on the above road.

General conditions of contract and plans may be inspected during office hours, and specification, bills of quantities and form of tender obtained from Mr. N. Chamberlain, Engineer and Surveyor, Town Hall, Matlock, on payment of a deposit of £2 2s., which will be refunded upon receipt of a bona fide tender.

Tenders in plain sealed envelope, endorsed "Tender for Street Lighting," must be delivered to the undersigned not later than 12 noon on the 3rd November, 1961.

The Council do not bind themselves to accept the lowest or any tender.

J. OWEN HUNT,
Clerk and Solicitor.

Town Hall, Matlock.
4th October, 1961.

2598

ALLESTREE PARISH COUNCIL

Trunk Road Lighting: A.6, Duffield Road

TENDERS are invited for the supply and erection of 34 Concrete Columns and 17 Steel Brackets on existing trolley poles complete with 140-watt Sodium Lamp Lanterns.

Specification, bill of quantities and form of tender may be obtained from the Clerk to the Council, on payment of a deposit of £2, which will be refunded on receipt of a bona fide tender.

Tenders to be returned in plain sealed envelopes endorsed "Trunk Road Lighting, Parish of Allestree," to the undersigned not later than 1st November, 1961.

ALBERT H. ALTON,
Clerk.

36, Bridge Street,
Belper, Derbyshire.

2635

RURAL DISTRICT COUNCIL OF SEDBERGH

Television System

TENDERS are invited for the erection of a Master Aerial, the provision of Amplifiers, and installation of Distribution Cable to 220 council houses in Sedburgh.

Detailed specifications and plans can be obtained from the undersigned on payment of £2 (returnable on receipt of a bona fide tender).

Tenders in plain sealed envelopes marked "T.V." to be in my hands by noon on the 8th November, 1961.

D. WARING,
Clerk of the Council.

Council Offices,
Sedburgh.
9th October, 1961.

2634

CITY AND COUNTY OF BRISTOL

Home for Elderly Persons, 100, Fishponds Road

New Fire Alarm System

TENDERS invited from Electrical Wiring Contractors who are on roll of National Inspection Council for Electrical Installation Contracting for installation of a new Fire Alarm System at 100, Fishponds Road, Bristol, 5.

Copies of conditions of contract, specification and schedule of prices from City Engineer and Planning Officer, Cabot House, Deanery Road, Bristol, 1.

Tenders, enclosed in envelope provided, endorsed "Fire Alarms, 100, Fishponds Road," but bearing no mark to indicate sender, to City Engineer and Planning Officer by 10 a.m. on 17th November.

2654

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

Advertisements are accepted up to first post on Monday of the week of issue

If blocks, bold type or ruled borders are required then on Friday prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

PETERBOROUGH RURAL DISTRICT COUNCIL

Dale Mobile Alternator Unit

TENDERS are invited for the supply and delivery of a "Dale" Mobile Engine/Alternator unit.

Specification and tender form can be obtained from the Council's Surveyor (Mr. M. R. Gibbs) at 51, Priestgate, Peterborough, and completed tender form should be delivered to the undersigned in the envelope provided not later than 10 a.m. on Tuesday, 14th November, 1961.

G. W. WRIGHT,
Clerk of the Council.

51, Priestgate,
Peterborough.
12th October, 1961.

2653

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

ASSISTANT CONSUMERS' ENGINEER required in the Southport District of the Board's No. 1 Sub-Area. Salary is within the range of £765/£870 per annum (N.J.B. F/11).

Duties include estimating for contracting work and advising consumers on electricity supply matters and appliances. Applicants should preferably have the Ordinary National Certificate in Electrical Engineering or equivalent qualification.

Appointment subject to medical examination. Pension scheme.

Standard application forms should be forwarded to the Manager, No. 1 Sub-Area, 24, Hutton Garden, Liverpool, 3, not later than 3rd November, 1961.

2671

DORMAN & SMITH LTD.

require

TECHNICAL SALES REPRESENTATIVES

SUCCESSFUL applicants will be of H.N.C. standard and have had some experience of selling low and medium-voltage electrical distribution gear. The work will provide an opportunity of taking an active part in the development of comparatively new electrical distribution practice in the U.K.

Apply to:—

The Secretary
DORMAN & SMITH LTD.
Atherton Works, Preston, Lancs

2558

Situations Vacant (continued)



MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Headquarters

THIRD ASSISTANT ENGINEER (Meters) (Meter Testing Station, Aston Fields, Bromsgrove, Worcs).

Applicants should possess technical qualifications to H.N.C. standard and have a sound experience in modern repair and testing methods for single-phase and three-phase meters. The duties will consist of the supervision of the Meter Repair and Test Sections at the Aston Fields Meter Testing Station, dealing with all types of single and three-phase meters, time switches and instruments. Salary within the range £1,145/£1,410 per annum (N.J.B. Grade K.8).

GENERAL ASSISTANT ENGINEER (Meters) (Meter Testing Station, Aston Fields, Bromsgrove, Worcs).

Duties will include the testing of three-phase metering equipments and assisting in the commissioning, routine testing and maintenance of bulk supply metering equipments. Applicants should possess suitable technical qualifications and have had a satisfactory training in metering. Salary within the range £675/£870 per annum (N.J.B. Grade K.15).

Apply by letter within 14 days, stating age, experience, present position and salary, to the Secretary, Midlands Electricity Board, P.O. Box No. 8, Mucklow Hill, Halesowen, near Birmingham.

Birmingham Area

SECOND ASSISTANT DISTRICT ENGINEER (Sutton Coldfield and North East District).

Extensive experience necessary with high-voltage, medium-voltage and protective systems. Applicants should have technical qualifications commensurate with eligibility for Associate Membership of the I.E.E. Salary £1,350/£1,500 per annum (N.J.B. Grade K.7).

Apply by letter within 14 days, stating age, experience, qualifications, present position and salary, to Emil Braathen, Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

F. W. CATER,
Secretary.
2652

LONDON ELECTRICITY BOARD

Assistant Distribution Engineer

APPLICATIONS are invited for the above position in the Board's Borough District at 15, Penrose Street, London, S.E.17.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience in all branches of engineering work associated with the organisation of a District distribution department.

Housing accommodation could be made available to the successful applicant.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, £1,090 per annum, rising to £1,215 per annum, inclusive of London allowance.

Applications stating age, qualifications and experience should be sent to the Manager at the above address within fourteen days of the publication date of this notice. Please quote ref. PER/V/3387/R.

2669

THE UNIVERSITY OF MANCHESTER

Electrical Engineer

APPLICATIONS are invited for the position of ELECTRICAL ENGINEER in the Buildings Section of the Bursar's Department. The person appointed will be responsible for the maintenance of electrical services throughout the University and for minor alterations and additions to electrical installations.

Applicants should be Chartered Electrical Engineers or have other approved professional qualifications.

Salary in the range £1,600-£1,850 per annum according to qualifications and experience. In addition, a child allowance (£50 per annum for each child in receipt of full-time education) is payable. The post carries membership of the Federated Superannuation System for Universities.

Further particulars may be obtained from the Bursar, The University, Manchester, 13, to whom applications should be sent as soon as possible.

2566

WELSH HOSPITAL BOARD

Engineer's Division

Assistant Regional Engineer: Salary £1,825-£2,175

APPLICATIONS are invited for the above post from corporate members of the major professional engineering institutions.

The successful candidate will:—

- (a) be responsible for co-ordination and design work for major engineering schemes;
- (b) act as liaison officer with the architect and consulting engineers in the design of the schemes;
- (c) be required to analyse and survey critically completed capital projects.

He should have a good knowledge of engineering installations in hospitals both as regards the mechanical and electrical services and plant.

New entrants to the service will commence at the minimum. The post is superannuable and Whitley conditions of service apply.

Applications to the Secretary, Temple of Peace and Health, Cathays Park, Cardiff, within 14 days of the appearance of this advertisement, giving details of age, qualifications, experience, present position and salary, and the names of two referees.

2642

EXPERIMENTAL OFFICERS AND ASSISTANT EXPERIMENTAL OFFICERS

required by ROYAL MILITARY COLLEGE OF SCIENCE, SHRIVENHAM, BERKSHIRE, to act as Demonstrators in Department of Electrical and Instrument Technology; to assist in supervision of students' laboratory work and in research by staff and students. Extensive well-equipped laboratories. Opportunities to engage in personal research in the fields of electrical engineering, electronics, computing and servo-mechanisms. Qualifications: G.C.E. "A" level, pass degree, H.N.C. or equivalent.

Salary:—

Experimental Officers, £1,057 - £1,336.

Assistant Exp. Officers, £450 - £983.

Opportunity for establishment and promotion. Quarters available for single man, possibility of house for married man.

Forms from Ministry of Labour, Technical and Scientific Register (K), 28, King Street, London, S.W.1, quoting reference D.512/1A.

2659

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable positions in a large showroom to be opened shortly in Glasgow.

1. DISPLAY ASSISTANT (Ref. C16/61).

Applicants must have considerable experience in large store and exhibition display, be thoroughly conversant with up-to-date display techniques and materials, and capable of creating and installing modern displays. A knowledge of the electrical industry is preferable but not essential. A selling background will be an advantage.

Salary £890/£1,010 per annum.

2. SENIOR SERVICE CENTRE ASSISTANTS (2) (Ref. C17/61).

Applicants must have a first-class selling background in a large organisation, be capable of controlling staff, and training junior staff. Experience in the electrical industry is essential, and a thorough knowledge of modern electrical appliances is necessary. The holding of the E.D.A. Salesmanship Diploma will be an advantage.

Salary £780/£880 per annum.

3. SENIOR DEMONSTRATOR (Female). (Ref. C18/61).

Applicants must be fully experienced in public demonstration work, be capable of supervising a large demonstration theatre, and of training young demonstrators. A domestic science qualification and a thorough knowledge of modern electrical appliances are essential. Sales experience will be an advantage, as also will the E.A.W. Demonstrators' Certificate.

Salary £700/£775 per annum.

4. DEMONSTRATOR (Female) (Ref. C19/61).

Applicants must be experienced in presenting public demonstrations, and capable of assisting the Senior Demonstrator in supervising the theatre and training staff. A knowledge of electrical appliances is necessary as also is a domestic science qualification. Sales experience will be an advantage.

Salary £600/£700 per annum.

Applications giving age, details of experience, qualifications, etc., and quoting appropriate reference, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 30th October, 1961.

2631

LONDON ELECTRICITY BOARD

Apprentices' Instructor

APPLICATIONS are invited for a post as APPRENTICES' INSTRUCTOR at the Board's Training Centre at 57, Pratt Street, Camden Town, London, N.W.1.

The Instructor will work under the Senior Apprentice Instructor, should have been a skilled craftsman with some previous experience in instructing, and be capable of teaching any of the basic workshop skills with hand tools. In particular, he should be able to deal with instruction in bench fitting and sheet metal work. Experience of workshop processes generally and the possession of trade or technical qualifications will be an advantage.

The post is graded under Schedule A of the National Joint Board Agreement, Class K (Area) as Grade 11 and the commencing salary will be within the range £950 per annum to £1,215 per annum inclusive of London allowance. The successful candidate will be required to work such hours as may be necessary in order effectively to supervise the apprentices under instruction.

Application form obtainable from the Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed within fourteen days of the publication date of this notice. Please quote ref. PER/V/3428/R.

2637

You'll find room to expand with 'ENGLISH ELECTRIC'

INSULATION ENGINEER

Kidsgrove

An Electrical Engineer is required who would like to specialise in the application of case epoxide and similar resins. The department is expanding and currently manufacture a wide range of components. The work will embrace all engineering aspects necessary to promote the successful introduction of resin castings, some design and design liaison with customers, process instructions, and the testing of the materials and products. Candidates should be of H.N.C. standard and have some experience in the application of epoxide resins in the electrical industry.

Applications should be made in writing, give details of age, qualifications and experience, and be addressed to the Technical Staff Officer, Dept. G.P.S., English Electric House, Strand, London, W.C.2, quoting reference No. E.R. 3950.

'ENGLISH ELECTRIC'

2656

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region, North Thames Division

APPLICATIONS are invited for the following appointment:—

GENERAL ASSISTANT ENGINEER, NORWICH GENERATING STATION (Norfolk) (S.V. No. 1548).

Salary N.J.B. Class F, within the range of Grades 14/12, Scales 1/3, £625-£805 p.a., plus 10% shift allowance when required to work on shift.

The duties of the successful applicant will include assisting in the control room on shift and other operation and investigation duties.

The commencing salary will depend upon qualifications and the duties and responsibilities.

Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications, quoting reference S.V. No. 1548, stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 28th October, 1961.

F. W. SKELCHER,
Assistant Regional Director.
2648

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

DEPUTY POWER STATION SUPERINTENDENT is required for Stourport "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary, in accordance with Schedule A, Grade K.2, £1,920-£2,085 per annum.

Candidates should have a wide experience in the operation and maintenance of a large modern power station and should have sound administrative ability. The possession of a university degree in engineering or Corporate Membership of the Institution of Electrical or Mechanical Engineers will be an advantage.

Apply, quoting Vacancy No. 228/61 MR, on form AE6, available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport-on-Severn, Worcs., to whom they should be returned to arrive not later than 3rd November, 1961.

2683

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

Fourth Assistant Engineer (Drawing Office), Electrical

APPLICATIONS are invited for the position of FOURTH ASSISTANT ENGINEER (Drawing Office) in the Regional Electrical Engineer's Department. Candidates should possess a sound practical and technical training and have experience in the layout of electrical equipment.

The work consists of preparation of drawings associated with the construction of H.V. substations.

Superannuable appointment, commencing salary according to qualifications and experience within the range £920-£1,245 per annum.

Apply, quoting Vacancy No. 225/61 MR, on form AE6, available from the Regional Personnel Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 30th October, 1961.

2650

THE GENERAL ELECTRIC COMPANY LIMITED

has vacancy for a

SENIOR TEST ENGINEER

in their Power Plant Division
based at Erith, Kent.

The work involves efficiency testing and performance investigation of large turbo-alternators, blower and compressor plant in the U.K. and overseas, together with submission of test reports.

Applicants should have had thorough experience in this field.

The post offers good prospects for a man with ability and initiative.

There is a superannuation fund and life assurance scheme.

Apply giving particulars of age, education and experience to the Personnel Manager, The General Electric Company Limited, Erith, Kent.

2655

AIR MINISTRY WORKS DEPARTMENT

invites applications for positions as STATION ENGINEERS Grade III at R.A.F. and Ministry of Aviation establishments throughout the United Kingdom to supervise the installation, operation and maintenance of electrical and/or mechanical plant.

SALARY, which is dependent upon age, quals. and exp., ranges in the U.K. from £801 (National rate) at age 25 to £988 max. in Grade III.

QUALS. and EXP. Applicants, who must be natural-born British subjects up to age 35, should have served an apprenticeship and should hold an O.N.C. or C. & G. Technical Cert. or 2nd Class M. of T. Cert. or equiv. Experience is required in one or more of the following:—

- Electrical generation.
- Electrical distribution, H.T. and L.T.
- Electrical installations, industrial & domestic.
- Light current and/or electronic engineering.
- Ventilation and air conditioning.
- Heating and hot water supply.
- Compressed gases and refrigeration.
- Bulk fuel installation.
- Diesel engine-driven plant.

Internal training courses provided and financial assistance and time off may be allowed for recognised courses of study leading to higher qualifications.

PROSPECTS. Appointments are non-pensionable but retirement/resignation gratuity payable after 5 years' or more service. Excellent opportunities of obtaining permanent pensionable posts (with all service counting) and of advancement to the higher grades in which posts number 480 approx.

Higher grade salaries vary between £988 and £1,747 p.a. (National rate) and vacancies are, as a rule, filled by promotion of serving staff. Opportunities for overseas tours for which special allowances ranging at present up to £1,800 p.a. are payable in addition to a higher salary. 5-day week with 26½ days' paid leave a year initially including public holidays.

Forms from Manager (PE.1), Ministry of Labour, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only applicants selected for interview will be advised.

269

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance.

FOURTH ASSISTANT ENGINEER, MEASUREMENTS SECTION, ELECTRICAL DEPARTMENT, CHURCHFIELDS ROAD, BECKENHAM, KENT (Vacancy No. 61/619).

The successful candidate will be required to calibrate and test either polyphase meters and all types of indicating and recording instruments or various types of electronic measuring instruments. Candidates should have H.N.C. (E.) or its equivalent, but consideration will be given to those holding O.N.C. (E.) providing they have adequate experience of the work outlined above and are continuing their studies.

Salary Class K (Division), Grade 11 = £950-£1,215 per annum, or Grade 10 = £1,030-£1,295 per annum, according to qualifications and experience.

Applications, quoting vacancy number, to (or on form from) Personnel Department, Central Electricity Generating Board, P.O. Box No. 136, London, W.1, to be received not later than 31st October, 1961.

2643

Situations Vacant (continued)**CENTRAL ELECTRICITY
GENERATING BOARD****Western Division****GENERAL ASSISTANT ENGINEER**
(Operation) required at
PORTISHEAD "B" GENERATING
STATION (W/AV/97/61).

Superannuation scheme. Salary N.J.B. Class K, Grade 13, Scale 6, £890/£1,015 p.a., plus 10% shift enhancement (minimum £90).

Candidates should preferably hold, or be studying for, a Higher National Certificate or similar qualification.

ASSISTANT ENGINEER
(Operation) required at
BERKELEY NUCLEAR POWER
STATION (W/AV/98/61).

Superannuation scheme. Salary N.J.B. Class M, Grade 12, Scale 9, £1,115-£1,245 p.a., plus 10% shift enhancement.

Applicants should preferably hold a Higher National Certificate in Mechanical or Electrical Engineering or equivalent qualifications. Experience in modern power station operations will be an advantage.

The successful candidates will be engaged initially on plant inspection and commissioning work, subsequently transferring to reactor control duties. Opportunity will be given for training in nuclear power techniques to fit candidates for more senior appointments.

ASSISTANT SHIFT CHARGE ENGINEER
required at
BERKELEY NUCLEAR POWER
STATION (W/AV/99/61).

Superannuation scheme. Salary N.J.B. Class M, Grade 8, Scale 13, £1,440-£1,610 p.a., plus 10% shift allowance.

Applicants should preferably possess the necessary technical qualifications for admission to corporate or graduate membership of a senior engineering institution. Experience in a modern conventional power station is essential.

The successful applicant will be required to attend a course of theoretical and practical training of approximately six months' duration prior to taking up his appointment.

GENERAL ASSISTANT CHEMIST
required at
BERKELEY NUCLEAR POWER
STATION (W/AV/100/61).

Superannuation scheme. Salary N.J.B. Class M, Grade 14, Scale 7, £965-£1,090 per annum.

Candidates should preferably possess a Higher National Certificate in Chemistry or equivalent, together with some industrial experience. Knowledge and/or practice in radio-chemistry would be an advantage.

The successful applicant will be one of a team supplying chemical services to the nuclear power station calling for a sound theoretical knowledge and a practical approach to a variety of chemical problems.

Applications on form A.E.6/ACT, obtainable from the Personnel Department, 26, Oakfield Road, Bristol, 8, should be completed and returned by 31st October, 1961.

2677

**CENTRAL ELECTRICITY
GENERATING BOARD****South Thames Division****Brighton "A" Power Station****AMENDMENT TO VACANCY NOTICE**
No. 264/61**ASSISTANT ENGINEER (ELECTRICAL
MAINTENANCE)** (13th October issue)

Please note that the salary scale quoted for this vacancy should be £890-£1,015 per annum.

2681

**CENTRAL ELECTRICITY
GENERATING BOARD****South Eastern Region, North Thames Division**

APPPLICATIONS are invited for the following appointment:—

SHIFT CHARGE ENGINEER,
LITTLE BARFORD GENERATING
STATION (St. Neots, Hunts)
(S.V. No. 1551).

Salary N.J.B. Class J, Grade 6, Scale 12, £1,350-£1,500 per annum plus 10% shift allowance.

Applicants should have served an apprenticeship and obtained a Higher National Certificate in Electrical or Mechanical Engineering, or equivalent qualification. Preference will be given to applicants who have had experience in the operation of large modern units utilising pulverised fuel.

Housing accommodation may be available for the successful applicant.

Applications, quoting reference S.V. No. 1551, stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 28th October, 1961.

F. W. SKELCHER,
Assistant Regional Director.
2647

**CENTRAL ELECTRICITY
GENERATING BOARD****Midlands Region****East Midlands Division****A**SSISTANT ENGINEER (Operation),
CASTLE DONINGTON
POWER STATION
(Vacancy No. 225/61).

Applications are invited for the position of Assistant Engineer (Operation) at Castle Donington Power Station, Castle Donington, near Derby. Candidates should have had operating experience on large modern pulverised fuel fired boilers and associated turbines.

Salary will be in accordance with Class L, Grade 10 (£1,190-£1,325 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 27th October, 1961.

This appointment is pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
2682

AEI A.E.I. LAMP AND LIGHTING CO., LTD.**DESIGN ENGINEER**

A.E.I. Lamp & Lighting Company require an engineer for their Lighting Engineering Department at Hereford, to work on the design and development of discharge lamp ballasts.

Technical qualifications to HNC standard are desirable and experience in this type of work would be an advantage.

Apply, giving details of age, experience and technical qualifications, to:

The Personnel Officer, A.E.I. Lamp & Lighting Co., Ltd., Rotherwas Works, Hereford

2665

SOUTHERN ELECTRICITY BOARD**Planning Engineer**

Heston District of No. 1 (Southall) Sub-Area. Salary N.J.B. Class H, Grade 7 (£1,190-£1,325 per annum, plus £50 per annum London allowance). N.J.B. conditions of service.

The duties will include preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground networks up to and including 11 kV. The appointment will involve standby duties.

The successful applicant will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.1393, not later than 30th October, 1961.

2670

SOUTH WALES ELECTRICITY BOARD**West Wales Area**

APPPLICATIONS are invited for the following positions:—

(a) COMMERCIAL ASSISTANT,
PEMBROKESHIRE DISTRICT (Tenby)
(Reference 130/61/ER).

Salary N.J.B. Class F, Grade 7, Scale 8, £1,040/£1,165 per annum.

(b) ASSISTANT ENGINEER,
PEMBROKESHIRE DISTRICT
(Haverfordwest) (Reference 131/61/ER).

Salary N.J.B. Class F, Grade 11, Scale 4, £765/£870 per annum.

(c) ASSISTANT ENGINEER,
SOUTH CARDIGANSHIRE DISTRICT
(Cardigan)
(Reference 13/61/ER/Re-advertised).

Salary N.J.B. Class E, Grade 10, Scale 4, £765/£870 per annum.

Preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications, experience, and endorsing envelope with the appropriate reference, should be addressed to E. Broughton, A.M.I.E.E., Manager, West Wales Area, South Beach Pavilion, Tenby, to arrive not later than 4th November, 1961.

R. G. WILLIAMS,
Secretary.
2689

ASSISTANT ELECTRICAL ENGINEER

in consulting engineers' London office. Design drawing, supervision of electrical installations in schools, hospitals, factories, etc.

5-day week, superannuation, salary range £800/£1,000 p.a.

Apply in writing to R. W. Gregory & Partners, 42, Kingsway, London, W.C.2.

2658

**CENTRAL ELECTRICITY
GENERATING BOARD****South Eastern Region****Regional Research and Development Dept.**

APPPLICATIONS are invited for the following positions in the above Department, located at West Farm Place, Chalk Lane, Cockfosters, Herts., unless otherwise indicated. Salaries, inclusive of London allowance, will be within the ranges described, dependent on experience, in accordance with Class L of the N.J.B. Agreement.

**MECHANICAL AND
THERMODYNAMICS BRANCH****(a) FOURTH ASSISTANT ENGINEER**
(Vacancy No. SE.49/61).

Duties will be to assist in carrying out investigational work at power stations and in a laboratory. Applicants should have a Degree or Higher National Certificate and some experience of power plant. Opportunity will be given to obtain further experience with a variety of projects, and there are good promotion prospects.

ELECTRICAL BRANCH**(b) THIRD ASSISTANT ENGINEER**
(Vacancy No. SE.50/61).

The successful candidate will be responsible to the Transmission Section Head and will assist in the electrical laboratory and with field work in technical problems concerning electrical transmission plant, including overhead lines, underground cables and switching and transforming equipment. Applicants should have a sound technical training with experience in electrical power system work. A recognised electrical engineering qualification leading to Corporate Membership of the Institution of Electrical Engineers is essential, and a University Degree would be an advantage.

(c) FOURTH ASSISTANT ENGINEER
(Vacancy No. SE.51/61).

The successful candidate, who will be assisting in carrying out automatic control research, will be based initially at Croydon Generating Station and will be expected to reside within a reasonable distance of his place of work. A knowledge of the operation and design of electrical plant in a generating station is necessary, and experience in instrumentation techniques and a recognised qualification leading to Corporate Membership of the Institution of Electrical Engineers would be an advantage.

Salary:—

Posts (a) and (c):

Grade 9/10/11, £970-£1,460 p.a.

Post (b):

Grade 6/7/8, £1,215-£1,780 p.a.

Applications, giving vacancy number, age, qualifications, experience, etc., should be sent to the Regional Secretary, Central Electricity Generating Board, South Eastern Regional Headquarters, Ergon House, Horseferry Road, London, S.W.1, to be received by 31st October, 1961.

2690

INSPECTING ENGINEER

required by Consulting Engineers to be based on their Manchester (Didsbury) office, but candidates must be willing to spend periods of service elsewhere in the U.K. and abroad.

Applicants should have had a sound electrical engineering training with subsequent experience mainly in the switch-gear field. They must also possess at least Graduate Membership of the I.E.E.

Salary and prospects would be commensurate with the character of the appointment.

Application forms are obtainable from Staff Appointments, Kennedy & Donkin, 813a, Wilmslow Road, Manchester, 20.

2629

ELECTRIC MOTOR PRODUCTION SUPERINTENDENT

A Major Domestic Appliance Company in the South of England, requires a first class engineer to organise and control the manufacture of fractional horsepower motors (AC/DC).

A top salary will be paid for wide experience in this field.

Box No. 2627

CITY OF STOKE-ON-TRENT**City Architect's Department**

APPPLICATIONS are invited for the following appointments to form a new Electrical Engineering Group in the City Architect's Department:—

(a) SENIOR ASSISTANT ELECTRICAL ENGINEER.

Grade A.P.T. V, £1,310-£1,480.

(b) TWO ASSISTANT ELECTRICAL ENGINEERS.

Grade A.P.T. III, £960-£1,140.

The person appointed to post (a) will be in charge of the Electrical Engineering Group and assist with the testing of protective gear, the commissioning of new plant and equipment, the testing of H.V. metering schemes, the testing of instruments and instrument transformers, and with technical calculations.

Candidates for posts (b) should be properly trained Electrical Engineers of not less than Higher National Certificate standard.

Applicants must have had design and estimating experience as Consumers' or Contracts Engineers and be capable of preparing designs and specifications for electrical installations for buildings, including housing, schools and other public buildings.

Previous local authority experience desirable but not essential. Commencing salaries within the above grades according to qualifications and experience.

Applications giving details of qualifications, training and previous experience, and names of two referees, to be sent to J. R. PIGGOTT, T.D., F.R.I.B.A., City Architect, Kingsway, Stoke-on-Trent, not later than Friday, 3rd November, 1961.

HARRY TAYLOR,
Town Clerk.

2641

**CENTRAL ELECTRICITY
GENERATING BOARD****West Midlands Division**

ASSISTANT SHIFT CHARGE ENGINEER is required at Ocker Hill Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.9, £965-£1,090 per annum plus 10% for shift duties.

A sound technical training and practical power station experience are required in the operation of steam generating plant and main switchgear. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 231/61 MR, on form AE6, available from the Station Superintendent, Ocker Hill Power Station, Ocker Hill, Tipton, Staffs. Closing date for receipt of applications, 30th October, 1961.

2686

SENIOR TRANSFORMER DESIGNER

with experience of various types up to 5 MVA. This appointment carries a very realistic salary and scope for the future for the right man between 30-40.

A company house is available if required. Factory is situated in ideal rural surroundings four miles from the sea.

Apply Chief Designer, London Transformer Products Ltd., Bridgend, Glam.

266

YORKSHIRE ELECTRICITY BOARD**No. 4 (Leeds) Sub-Area**

SECOND ASSISTANT ENGINEER (Distribution Design). Applicants should have had experience in the design, construction and operation of large-scale networks, the preparation of technical reports and the assessment of load growth and development.

Salary N.J.B. Class L, Grade 7 (Scale 13), £1,440/£1,610 per annum.

FOURTH ASSISTANT ENGINEER (Meters Testing and Protection) (2 Posts). The successful applicants will be required to assist with the testing of protective gear, the commissioning of new plant and equipment, the testing of H.V. metering schemes, the testing of instruments and instrument transformers, and with technical calculations.

Salary N.J.B. Class L, Grade 13 (Scale 7), £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 3rd November, 1961.

No. 1 (Bradford) Sub-Area

DEMONSTRATOR. Candidates should have had domestic science training, including electrical housecraft, and should preferably hold the E.A.W. Certificate or Diploma. They should be competent to lecture and advise consumers on the utilisation of domestic electrical appliances and be able to give demonstrations with a sales emphasis. The successful applicant will be located at Bradford, but may be required to work throughout the Sub-Area if the occasion demands.

Salary N.J.C. Grade 1, £600/£25/£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford, not later than 3rd November, 1961.

2673

**SENIOR SALESMAN
REQUIRED BY FALKS**

FOR SPECIALIZED SALES PROMOTIONAL WORK ON ELECTRICAL WIRING ACCESSORIES, MAINLY IN MIDLANDS AND NORTHERN COUNTIES. CANDIDATES MUST BE PREPARED TO TRAVEL CONTINUOUSLY ALL OVER THE COUNTRY. POSITION IS PERMANENT, PROGRESSIVE AND PENSIONABLE. WRITE STATING AGE, SALARY REQUIRED AND FULL DETAILS TO

"A" DEPT.

91 FARRINGTON RD., LONDON, E.C.1

2639

Situations Vacant (continued)

Eastern Electricity

Chilterns Sub-Area

DEMONSTRATOR, NORTHWOOD DISTRICT (215/61.R).

Candidates should have had domestic science training, including electrical housecraft; should preferably hold the E.A.W. Certificate and be competent to plan and give cookery demonstrations, including lectures, and to help housewives to select, buy and use efficiently appliances most suited to their needs.

Salary N.J.C. Grade 1, £600-£700, plus London weighting.

Apply by letter to the Manager, Northwood District, Eastern Electricity Board, 1, Love Lane, Pinner, by 20th November, 1961.

Fens Sub-Area

FITTER (Electrical), PROTECTION SECTION (216/61.R).

Applications are invited for the position of Fitter (Electrical) to work with the Sub-Area Protection Section based at Thompsons Lane, Cambridge.

Duties will include work in connection with the testing and commissioning of substations and protective gear over the whole Sub-Area.

N.J.C. rates and conditions. Present rate ss. 63d. for 42-hour five-day week.

Apply by letter to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 3rd November, 1961.

2666

CENTRAL ELECTRICITY GENERATING BOARD**South Eastern Region, North Thames Division**

APPLICATIONS are invited for the following appointment in the System Operation Department, Thames North Grid Control Centre, Redbourn, near St. Albans, Herts.

THIRD ASSISTANT ENGINEER.

Salary N.J.B. Class K, Grade 8, Scale 11, £1,145-£1,410 per annum plus 10% shift allowance (S.V. No. 1516).

The commencing salary will be within the above range at a point commensurate with qualifications and experience. The minimum technical qualification required is the Higher National Certificate in Electrical Engineering.

Some generating station and/or transmission/technical experience is essential. The successful applicant will be required to undertake shift duties in the Grid control room.

Forms of application (A.E.6/ACT) may be obtained from the Board's Headquarters, or from any Divisional Offices of the Board, and should be addressed to the Assistant Regional Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 28th October, 1961, quoting reference S.V. No. 1516.

F. W. SKELCHER,
Assistant Regional Director.

2694

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE CO. LTD.

Longridge House, Manchester, 4

ELECTRICAL SURVEYORS required. Permanent positions carrying progressive salary scale £825 to £1,225, with non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience.

2680

SOUTH WESTERN ELECTRICITY BOARD**GENERAL ASSISTANT DISTRICT ENGINEER (Drawing Office), TORBAY.**

Salary within Class G, Grade 12, Salary Scale 4 (£765 to £870 per annum) of the N.J.B. Agreement.

The duties of the successful candidate will include preparation of engineering drawings, mains and statistical records, and the recording and maintenance of L.V. and H.V. maps up to 33 kV.

Applicants should be capable of survey and profile, and have a knowledge of overhead design. Qualifications leading to the Higher National Certificate in Electrical Engineering are desirable and the possession of a current driving licence would be an advantage.

Applications for this post to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Electric House, Union Street, Torquay. Closing date for receipt of completed applications is 4th November, 1961.

DEMONSTRATOR, TAUNTON DISTRICT.

Salary within Grade 1 (£600 to £700 per annum) of the N.J.C. Agreement.

Duties will include the demonstration of cooking and other electrical appliances in service centres and consumers' premises, and advising on the selection and use of such apparatus. The successful candidate will also be required to undertake duties with exhibitions, shows, etc., including evening demonstrations for women's institutes and similar organisations.

Candidates should be of good general education, have some experience of public speaking, and should hold a recognised domestic science qualification, with preferably the E.A.W. Electrical Housecraft Certificate. Possession of a current driving licence will be an advantage.

Applications for this post to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, The Parade, Taunton. Closing date for receipt of completed applications is 4th November, 1961.

2678

SURREY EDUCATION COMMITTEE

Wimbledon Technical College,
Gladstone Road, London, S.W.19

REQUIRED 1st January, LECTURER IN ELECTRICAL ENGINEERING with special reference to Control, Systems; should have good teaching and industrial experience, and be prepared to teach to H.N.C. level and be responsible for servo mechanisms.

Salary Burnham Technical Scale for Lecturers, £1,370-£1,550 per annum, plus London allowance.

Application form and further particulars from Principal, to be returned within two weeks.

2688

INSPECTING ENGINEER

for electrical plant, with comprehensive experience in switchgear, transformers, cables and motors, age limit 50 years. Candidates should be prepared to travel anywhere on the Continent of Europe and Great Britain and be methodical and accurate.

Salary in accordance with qualifications; pension and bonus scheme.

Apply in writing stating age and brief particulars of qualifications to:—

PREECE, CARDEW & RIDER
8-12, Queen Anne's Gate
Westminster, S.W.1

2657

'ENGLISH ELECTRIC'**CONTROL ENGINEERING ESTIMATING DEPARTMENT**

The continued expansion of the activities of the Control Gear Division has created a vacancy for a Control Gear Estimator. His duties include the preparation of Unit estimates from drawings, and complete schemes including these units to Engineers' instructions.

Suitable applicants should be of O.N.C. standard with experience of "one-off" or small batch production in the motor control or industrial electronics field.

The Works is pleasantly situated on the Staffordshire/Cheshire border: there are now a large number of houses available for rental to employees, and assistance with removal expenses can be given in certain cases. Applications should be made in writing, giving details of age, qualifications and experience, quoting reference ER394L, and be addressed to the Director, Group Personnel Services, English Electric House, Strand, London, W.C.2. 2640

'ENGLISH ELECTRIC'**SOUTH EASTERN ELECTRICITY BOARD**

ASSISTANT DISTRICT ENGINEER, Herne Bay /Canterbury District. Salary £1,040-£1,165 per annum under N.J.B. Agreement, Class F, Grade 7 (Scale 8). Superannuable. Applicants should be suitably qualified and have operational experience of maintenance and construction on distribution systems up to 11 kV. A knowledge of planning work would be an advantage.

Applications, quoting ER and naming two referees, to the District Manager, SEEBOARD, 65, Mortimer Street, Herne Bay, by 1st November, 1961.

ASSISTANT (Administration), Woking District. Salary £780-£880 p.a. under N.J.C. Agreement, Grade 3. Superannuable. Applicants should possess sound general knowledge of a District chief clerk's department, with particular experience in insurance matters, transport returns and compilation of monthly progress statistics and personnel records. A knowledge of national agreements and conciliation machinery is essential.

Applications, quoting ER, on forms from the District Manager, SEEBOARD, 4, Chobham Road, Woking, by 1st November, 1961.

GEORGE WRAY,
Secretary.

2672

HUNTINGDONSHIRE**County Architect's Department****Technical Assistant (Electrical Engineer)**

APPLICATIONS are invited for the above appointment on Grade A.P.T. III (£960 to £1,140) or Grade A.P.T. IV (£1,140 to £1,310). Applicants for the Grade A.P.T. IV post must be Chartered Electrical Engineers (A.M.I.E.E.).

The person appointed will be a member of the engineering section of the department and his duties will consist of all work connected with electrical installations related to both small and large building projects.

Application forms may be obtained from S. M. Holloway, A.R.I.B.A., County Architect, County Buildings, Huntingdon, and completed forms should be returned to the undersigned by Monday, 30th October, 1961.

A. C. AYLWARD,
Clerk of the County Council.

County Buildings,
Huntingdon.

2626

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region, North Thames Division

APPPLICATIONS are invited for the following appointment:—

**MAINTENANCE ENGINEER (Electrical),
TILBURY GENERATING STATION
(Essex) (S.V. No. 1532).**

Salary N.J.B. Class K, Grade 6, Scale 13, £1,440-£1,610 per annum plus London weighting £60 per annum.

Applications, quoting reference S.V. No. 1532, ship and have had experience with the maintenance of modern pulverised fuel-fired boilers, turbines and coal and ash handling plants. Operating and supervisory experience and appropriate technical qualifications will be an advantage.

Applications, quoting reference S.V. No. 1332, stating age, qualifications, experience and present position should be sent to the Assistant Regional Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 4th November, 1961.

F. W. SKELCHER,
Assistant Regional Director.
2693

CHRISTCHURCH CITY COUNCIL Christchurch, New Zealand

APPPLICATIONS are invited for the position of **GENERAL MANAGER** Municipal Electricity Department, Christchurch, New Zealand.

Applicants should have received a thorough training in electrical engineering and have had considerable experience in administration. Consideration will be given to the claims of an applicant who submits evidence of administrative ability or administrative or accountancy qualifications, in addition to his basic training in electrical engineering.

Application forms and conditions of appointment may be obtained from the Town Clerk, Christchurch City Council, P.O. Box 237, Christchurch, New Zealand, or from the office of Preece, Cardew & Rider, 8, 10 & 12, Queen Anne's Gate, Westminster, London, S.W.1.

Applications will close with Preece, Cardew & Rider on the 15th December, 1961.

2636

SOUTH WESTERN ELECTRICITY BOARD

**SENIOR COMMERCIAL ASSISTANT
(Mobile Sales),
PLYMOUTH DISTRICT.**

Salary within Grade 5 (£1,020 to £1,140 per annum) of the N.J.C. Agreement.

The successful candidate will be required to supervise and train in the field a team of approximately 18 Sales Representatives whose individual results will be his particular concern. He should have a good knowledge of electrical appliances, domestic and commercial installations, and the applications of electricity to water heating and space heating. A knowledge of the Board's sales policies and procedure is desirable.

The ability to drive a motor vehicle is most desirable.

Applications for this post to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, Elliott Road, Prince Rock, Plymouth. Closing date for receipt of completed applications is 4th November, 1961.

2679

TRANSFORMER PRODUCTION ENGINEER

AN engineer is required for process development and production of transformers with a company in South-Eastern England. Applicants should have a sound experience in all branches of power transformer manufacture, preferably up to 30 MVA. Applications stating age, qualifications, experience and salary required to—Box 2476.

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

**Third Assistant Engineer (Substations & Cables)
Regional Transmission Project Branch**

APPPLICATIONS are invited from engineers to supervise the work of contractors engaged in the installation of electrical plant, including cables, at 132-kV, 275-kV and 400-kV substations in the Region.

Candidates should have had previous experience on both the construction and maintenance of substation equipment, but applicants with experience of either will be considered.

It is desirable that the candidates should have qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Grade 8, Class K (£1,145-£1,410 per annum).

Form of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 3rd November, 1961.

2692

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

FOURTH ASSISTANT ENGINEER (Relief) is required in the System Operation Department and the duties will consist of relieving the Third Assistant Engineer (Control) on shift, in all control duties pertaining to the Birmingham Grid Control Area. When not required for relief duties he will assist in the Statistics and Costing Section of the System Operation Department.

N.J.B. service conditions, superannuable appointment, salary according to Grade 10, Class L, £995-£1,190/£1,325 per annum.

Applicants should have had sound technical training in the standard of the Higher National Certificate and have had operating experience within the supply industry.

Apply, quoting Vacancy No. 230/61 MR, on form AE6, available from the System Operation Engineer, Warwick House, Redhill Road, West Heath, Birmingham, 31, to be returned by 30th October, 1961.

2684

A LEADING MIDLANDS MANUFACTURER

of electrical wiring accessories
is seeking a

SENIOR DESIGNER

having experience in the field of light electro-mechanical devices, for which an appropriate salary will be paid.

The position offers adequate scope for initiative and originality under congenial working conditions with usual benefits.

Replies will be treated with absolute confidence and should be addressed to the Technical Director, J. A. Crabtree & Co. Ltd., Lincoln Works, Walsall.

2676

EAST MIDLANDS ELECTRICITY BOARD

Leicester Sub-Area

APPPLICATIONS are invited from suitably qualified and experienced persons for the following appointment. Applicants should state age, qualifications, experience, etc., and quote the vacancy number.

**FOURTH ASSISTANT DISTRICT
ENGINEER, EAST DISTRICT
(Re-advertised Vacancy No. 92/61).**

Salary N.J.B. Class F, Grade 12, £715 to £805 per annum.

The duties will include assisting in the operation, maintenance, planning and construction of rural and urban networks up to and including 11 kV.

The successful applicant will be required to reside in or near to Leicester, and to undertake standby duties.

Applications should be forwarded to the Manager, Leicester Sub-Area, Charles Street, Leicester, by the 3rd November, 1961.

2675

OVERHEAD TRANSMISSION LINES

CONSULTING ENGINEERS have a vacancy for a Contract Engineer familiar with design and contract administration of overhead transmission lines up to 132 kV. Experience with higher voltages an advantage. Corporate Membership I.E.E. preferred, but qualification not less than H.N.C. combined with suitable experience structural and mechanical aspects of line construction considered.

Salary according to qualifications. Bonus and pension schemes.

Applications, giving full details of age, qualifications and experience, to be made in writing within fourteen days to Preece, Cardew & Rider, 8-12, Queen Anne's Gate, Westminster, London, S.W.1.

2628

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

**Fourth Assistant Engineer (Surveyor),
Regional Transmission Project Branch**

APPPLICATIONS are invited from qualified Surveyors to undertake the surveying and profiling of 275-kV and 132-kV overhead line routes.

Candidates should be conversant with this kind of work and be able to prepare level grids for substation sites.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Grade 11, Class K (£800-£1,165 per annum).

Form of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 3rd November, 1961.

2693

Situations Vacant (continued)**CENTRAL ELECTRICITY
GENERATING BOARD****West Midlands Division**

THIRD ASSISTANT ENGINEER (Control) required to assist the Grid Control Engineer on shift in all control duties pertaining to the Birmingham Grid Control Area.

N.J.B. service conditions, superannuable appointment, salary according to Grade 8, Class L, £1,165-£1,350/£1,500 per annum plus 10% for shift duties.

Applicants should have had sound technical training to the standard of the Higher National Certificate, and have had operating experience within the supply industry.

Apply, quoting Vacancy No. 229/61 MR, on form A.E.6, available from the System Operation Engineer, Warwick House, Redhill Road, West Heath, Birmingham, 31, to be returned by 30th October, 1961.

2685

**CENTRAL ELECTRICITY
GENERATING BOARD****West Midlands Division**

SHIFT CHARGE ENGINEER is required at Hams Hall "C" Power Station, near Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.6, £1,440-£1,610 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear in a large modern power station are required, also a knowledge of P.F. firing. The station is one of advanced design. Appropriate qualifications an advantage.

Apply, quoting Vacancy No. 220/61 MR, on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warks., by 30th October, 1961.

2649

**CENTRAL ELECTRICITY
GENERATING BOARD****West Midlands Division**

SHIFT CHARGE ENGINEER is required at Warwick Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.7, £965-£1,090 per annum, plus 10% shift allowance.

Applicants should have a sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear. Appropriate technical qualifications will be an advantage.

Previous applicants will be re-considered and need not re-apply.

Apply, quoting Vacancy No. 226/61 MR, on form A.E.6, available from the Station Superintendent, Warwick Power Station, Emscote Road, Warwick, to whom they should be returned to arrive by 30th October, 1961.

2687

**MANCHESTER CORPORATION
TRANSPORT DEPARTMENT****Assistant Engineer (Electrical)**

QUALIFICATIONS: Final Examination of the Institution of Electrical Engineers or the H.N.C. To be responsible for preparation of electrical specifications, supervision of alterations to and maintenance of electrical installations on department's premises and maintenance of V.H.F. radio.

Salary £960/£1,310 per annum.

Application forms and further details of duties and conditions from General Manager, Dept. R, 55, Piccadilly, Manchester, 1, returnable by Monday, 30th October, 1961.

2630

COUNTY OF LANARK**Property Department**

ASSISTANT ELECTRICAL ENGINEER required for County Property Department, Motherwell. Salary scale £975/£1,055.

Applicants should preferably be Graduates of Institution of Electrical Engineers, should have extensive knowledge of electrical design for schools and other public buildings, have knowledge of electrical installation work, and be able to prepare drawings and specifications.

There is a superannuation scheme and a five-day week operates.

Applications giving all necessary particulars, together with the names and addresses of two referees, should be lodged with the undersigned within fourteen days of the appearance of this advertisement.

IAN V. PATERSON,
County Clerk.

P.O. Box No. 1,
Lanarkshire House,
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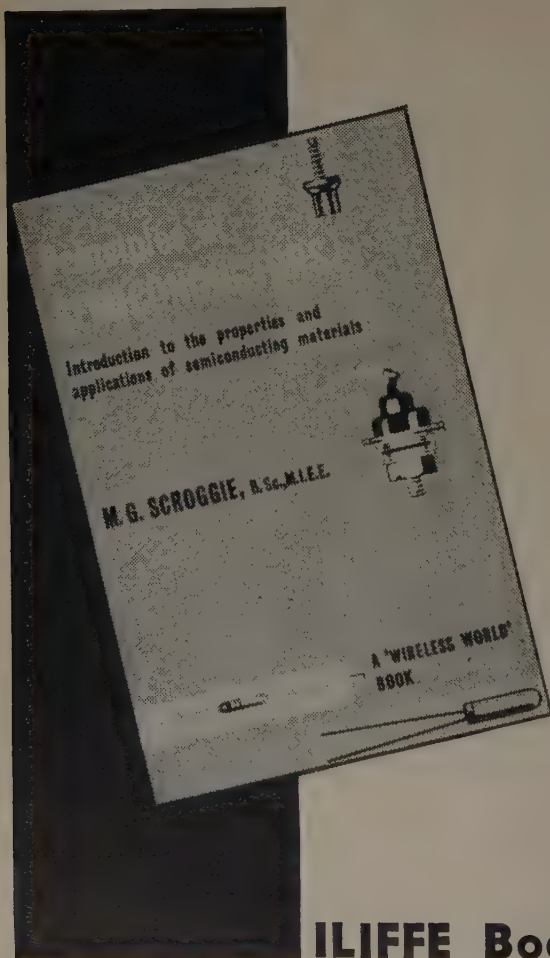
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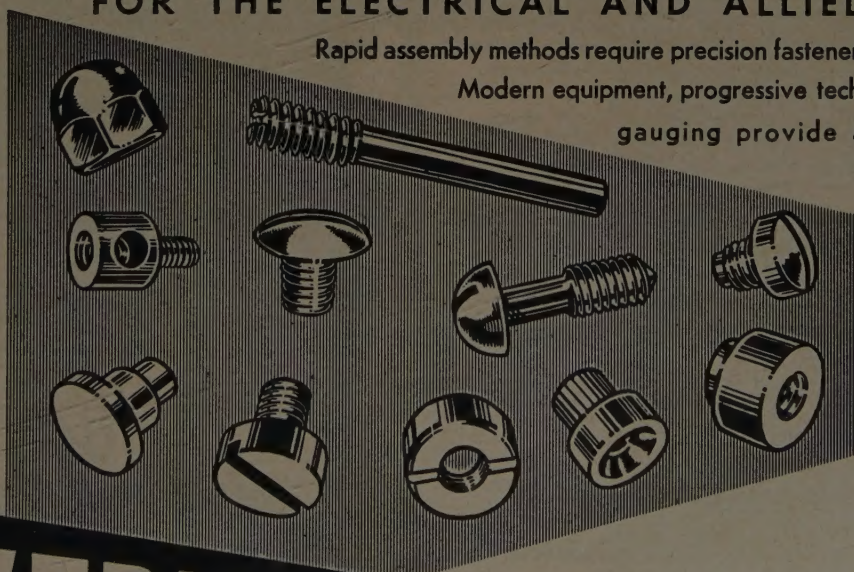
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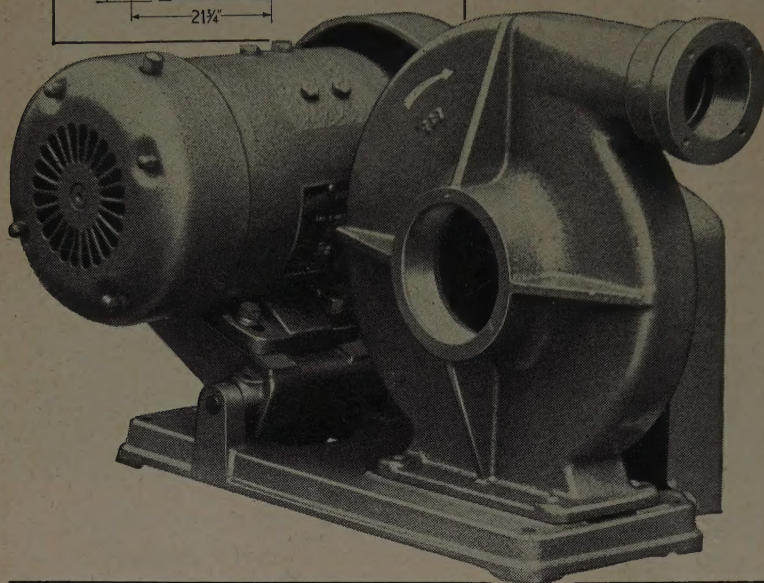
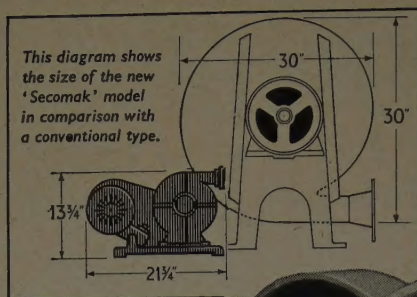


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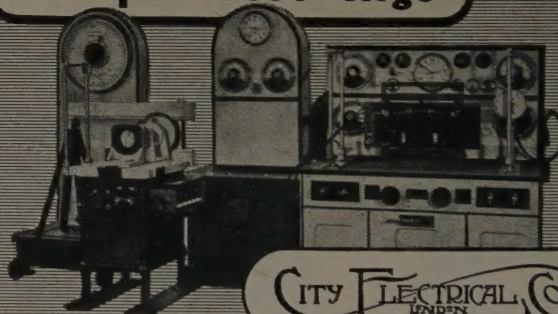
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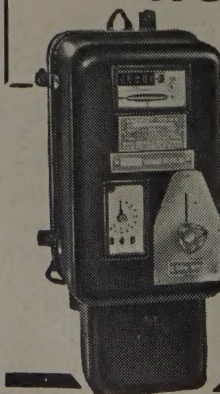
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